The Mining and Metallurgical Journal

Vol. XXII. No. 18 New York, N. Y. June 15, 1900 Los Angeles, Cal. Price 15 Cents

Table of Contents, page 251 Index to Advertisers, page V Buyers' Guide, page 266

For Making

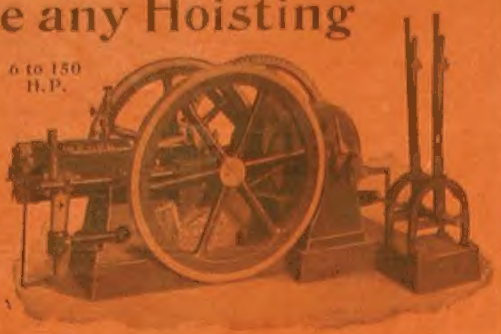
Oil and Water Wells and Testing Placer Ground

is work. Does the work at a very small cost. Drills water and oil wells and mineral test wells through any kind of rock to 1500 feet. Several sizes. Unexcelled for lead and zinc testing.

KEYSTONE DRILLER COMPANY, Beaver Falls, Pa.

If you've any Hoisting to do

6 to 150 H.P.



the Weber Gasoline or Oil Hoist is the thing to do it with. In sizes from 6 to 150 H. P., Single or Double Drum, for Gasoline, Gas or Distillate. Especially suited for mining, ship or quarry use. State size wanted and for what purpose.

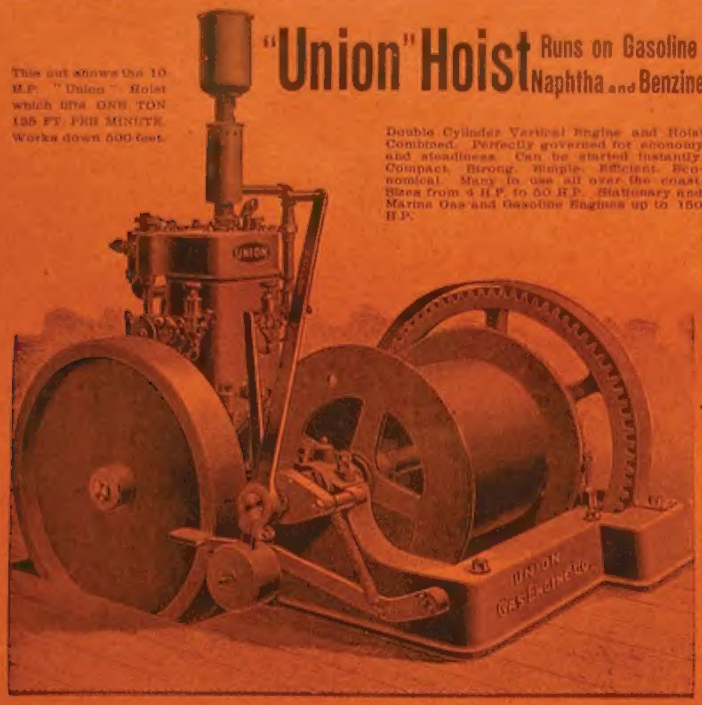
Weber Gas & Gasoline Engine Co., 434 S. W. Boulevard, Kansas City, Mo.

Chicago Office: 1531 Monadnock Block.

"Union" Hoist Runs on Gasoline Naphtha and Benzine

This cut shows the 10 H.P. "Union" Hoist which lifts ONE TON 135 FT. PER MINUTE. Works down 500 feet.

Double Cylinder Vertical Engine and Hoist Combined. Perfectly governed for economy and steadiness. Can be started instantly. Compact. Strong. Simple. Efficient. Economical. Many in use all over the coast. Sizes from 4 H.P. to 50 H.P. Stationary and Marine Gas and Gasoline Engines up to 150 H.P.



UNION GAS ENGINE CO.

301 HOWARD STREET, SAN FRANCISCO, CAL.

MONTANA ORE PURCHASING CO.

F. AUG. HEINZE, Pres. and Genl. Mgr. ARTHUR P. HEINZE, Sec.
JOHN MACGINNISS, Vice-Pres. STANLEY GIFFORD, Treas.

Authorized Capital, $2,500,000; Issued, $2,000,000.

Surplus, $1,250,000.

PURCHASERS, SMELTERS and REFINERS OF

COPPER, SILVER and GOLD ORES.

Smelting Works: BUTTE, MONT.

Offices: BUTTE, MONT., and 100 BROADWAY, NEW YORK.

WILLIAM H. EMANUEL,

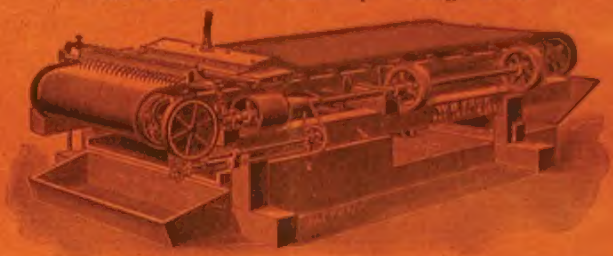
Representing RAND DRILL COMPANY, Air Drills and Compressors.
TRENTON IRON CO., Wire Rope and Bleichert Tramways.
HENRY R. WORTHINGTON and
DEANE STEAM PUMP COMPANY, Holyoke, Mass.
BALL ELECTRIC SYSTEM, Arc Lights and Dynamos.
ROBINS CONVEYING BELT COMPANY.
ROOT IMPROVED WATER TUBE BOILER.

General Mining, Milling, and Smelting Machinery.

1711-13 Tremont St., Denver, Colorado

FOUR and SIX FOOT FRUE VANNERS

With Brownell "Patent Lip" Flange Belts



After a Concentrator like the Frue Vanner has been on the market nearly two decades, and the sales have constantly increased, it is safe to say it is the "Standard Machine of the World." More Frue Vanners have been sold during the last twelve months than for the same period at any time during the history of the machine. Practical mining men in all parts of the world where mining is carried on will testify as to its merits. It is the "Standard" which all competitors are trying to imitate.

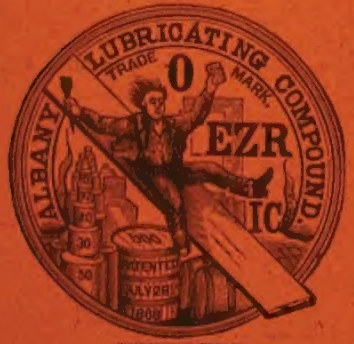
The results obtained by this machine are the "Acme" of concentration, and several cheap and untried machines that have lately come on the market compare by it, and the manufacturers will tell you that they are "just as good, and cheaper, etc." The facts are that no other concentrator made has an equal capacity, or will yield as clean a concentrate with as small loss in the tailings as the Frue Vanner. The amount saved from the lower first cost of an inferior machine counts little in the year's results, when compared with the increased output from a Frue. This machine not only gives better results at both ends of the belt (i. e. clean product and poor tailings), but is operated at less expense and requires less attention than any other machine on the market. At the Alaska Treadwell Mine, where they have ordered over 350 Frue Vanners one man attends 48 machines for 12 hour shift.

FOR DESCRIPTIVE PAMPHLETS, ADDRESS

JAS. S. BROWNELL
WESTERN AGENT
132 Market Street

Frue Vanning Machine Co.
(Successors to Adams & Carter)
SAN FRANCISCO, CAL.

The only Genuine ALBANY GREASE has this TRADE MARK on every package. Look for the Square Label.



MANUFACTURERS OF

Albany Dynamo and Albany Cylinder Oils

If you are not using these Oils, give them a trial at once, and be convinced. You will want no other.

ALBANY GREASE

LUBRICATES EVERYTHING

Especially Adapted to Mining and Milling Machinery.

Do any engineering and it will pay to use ALBANY GREASE at the proper prices.

MADE ONLY BY

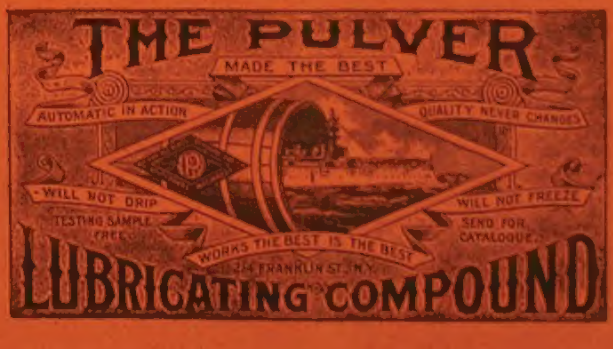
ADAM COOK'S SONS,
313 West St., New York.

BRANCHES:

TATUM & BOWEN,

21 Fremont Street, San Francisco, Cal.
404-6 First Street, Portland, Oregon.

21 South Canal Street, Chicago, Illinois.



INDEX TO ADVERTISERS; SEE PAGE 266 FOR BUYERS' GUIDE.

The Mining and Metallurgical Journal

Entered at the Post Office at New York, N. Y., as Second-Class Mail Matter.

VOL. XXII. JUNE 15, 1900 NO. 18

F. W. EDELSTEN, Editor.
O. S. BREESE, Associate Editor.
J. A. RAWSON, JR., Business Manager.

MAIN OFFICES

32 Broadway, New York, N. Y.
120 North Main St., Los Angeles, Cal.

BRANCH OFFICES:

San Francisco, Cal. - - - 64-65 Merchants Exchange
Chicago, Ill. - - - - - - 413, 59 Dearborn St.
Denver, Colo. - - - - - - 402-403 Quincy Bldg.
Salt Lake City, Utah - - - 15 W. Second South St.
Boston, Mass. - - - J. C. Kent, 205 Washington St.
Pittsburg, Pa. - - - - - W. L. Foulk's Son & Co.
City of Mexico, Mexico No. 4 Calle de San Juan de Letran

SUBSCRIPTION PRICE:

For United States, Mexico and Canada....$2.50 per annum
All other countries in the Postal Union...$3.50 per annum

NOTICE TO SUBSCRIBERS.

Subscribers should notify the publishers promptly if they fail to receive their copies in a reasonable time after the dates of issue—the first and fifteenth of each month. No delay will be caused by the expiration of subscriptions, as, in accordance with the usual custom, the JOURNAL is forwarded until orders to discontinue are received.

ISSUED SEMI-MONTHLY

TABLE OF CONTENTS.

Increased Copper Production.

It has been evident for a long time that the copper production of the world would in some way be increased enormously in accordance with the universal economic law of supply and demand, and we are now beginning to see where this additional supply will come from. All over the world, existing mines are being extended and developed as rapidly as time and capital will permit. New copper districts, moreover, are coming into prominence in various places. In our present issue, for example, we mention two such districts which are likely in the near future to become important producing regions.

It will be a long time yet before the supply of copper is so far diminished as to endanger the profits of good companies; but that such a time will come is unfailingly predicted by the economic history of all ages. The copper industry, however, is likely to suffer from competition of another sort before overproduction causes trouble—namely, from the threatening rivalry of aluminium. Elsewhere in this issue we print a startling prophesy as to that made by Nikola Tesla.

Resumption of Kaffir Mines.

The occupation by Lord Roberts's army of Johannesburg and Pretoria, and the evident speedy collapse of the war in South Africa, make it certain that the production of gold by the Witwatersrand mines will soon begin on a large scale. No completely authentic advices have yet been received concerning the condition of the mines, but the general belief is that no serious damage has been done to them. A few of the mines have been operated throughout the war, and these ought to be in complete working order. In other cases the machinery may have deteriorated somewhat from disuse, but these mines can be made within a short time as effective as ever.

Some surprise is shown at the failure of the London speculative public to boom the shares of the Kaffir mines at this time. Stocks have recovered considerably from the slump at the outbreak of the war, but no boom has recently ensued such as many people expected when the war ended. Various good reasons account for this comparative stagnation. Apart from the uncertainty as to the exact condition of the mines, the date of complete resumption of operations, the labor market, etc., grave anxiety is felt as to the burden of taxation that the British may think it proper to place upon the companies. Elsewhere in this issue, we print an instructive and interesting article on this subject.

Southern California Minerals.

The production of minerals by the counties south of the sixth standard line is hardly realized even by residents of the section. Estimated comparisons made some time ago by one of the editors of the Journal with reference to the southern counties and the whole state made a better showing for the south than the official figures warrant, but the exact, official figures are sufficiently significant, and the people of the state generally seem not to appreciate the real situation. This ignorance was brought forcibly to the attention of Southern California, when a representative in Congress from one of the northern districts stated "there is practically no gold or silver there (in the southern country)."

As a matter of fact, the southern portion of the state, according to figures furnished by A. S. Cooper, State Mineralogist, produced minerals to the value of $6,383,347, of which $1,541,795 was gold, $134,413 silver, and $4,707,139 other minerals, including petroleum oils, etc.

Of the nine counties in the state producing over one million dollars in minerals, three of them were south of the line mentioned. When it is stated that San Bernardino and Los Angeles counties rank ahead of such counties as Tuolumne, Amador, Calaveras and Placer, some conceptions of the importance of the mining industry of the south may be acquired.

The average value of the minerals produced in the nine counties of the south is $709,261, as compared with an average for the fifty-two counties of the state of $563,720, or about $145,541 more per county. The showing is still better for the south, if the average mineral production covers only the remaining forty-three counties: $533,258 would be the figure in that case, as compared with $709,261 for the nine southern counties.

The Iron and Steel Situation.

As everyone is clamorous to buy on a rising market, so everyone declines to buy on a falling market. Fearful that an eighth or a quarter may escape him, the wary buyer waits until bed rock has been reached as nearly as he can gauge it. That stage of the game is surely not far off in the present iron market, unless all signs fail and all precedents mislead. Steel rails are still far above normal price, owing to special causes, but many iron and steel staples have now reached a level that ought to be inviting to reasonable buyers. The underlying demand for iron in its various forms is enormous, however little the market reflects the fact at the moment.

Hon. Abram S. Hewitt, quoted at length in the Manufacturers' Record, points out the immensity of the new demand for iron. Declaring that the world is practically rebuilt about every thirty or thirty-five years, he illustrates the statement by citing the fact that his firm thirty-five years ago furnished the iron work for the first iron fireproof office building erected in New York, and that the building is now being demolished, to be replaced by another iron structure more in keeping with the times. Iron and steel are now going into so many new uses, continues Mr. Hewitt, that we may reasonably look for an accelerating rate of growth as compared with population rather than for a decrease. Steel car making, an industry of only a few years, in fact an infant industry, is already consuming about 400,000 to 500,000 tons of steel a year. These cars, carrying 100,000 pounds of freight instead of the 40,000 or 50,000 pounds carried by wooden cars, are requiring heavier locomotives, heavier rails, heavier and stronger bridges, and so their introduction almost forces the gradual rebuilding of many of our railroads. Large office buildings, even costly private dwellings, are now almost exclusively framed of iron. The whole world is busy in building ships for war as well as for commerce; every town must needs have its waterworks and sewerage systems; electric railways are no longer confined to cities, but are spreading out into suburban districts, and connecting smaller municipalities. The appetite for iron and steel seems almost insatiable. Mr. Hewitt says further:

"In this new era in the world's iron trade we have entered upon a period of permanently higher prices. I do not mean that we shall not have periods of activity and of depression as in the past, but we shall probably never again get down into such depths as we had a few years ago. The increasing consumption of iron and steel, the increasing cost of production in Europe and the centralization of these industries in strong hands instead of being in weak ones will keep the business on a basis of steady and reasonably profitable operation."

The Standard Oil Company.

Well Natured Designs of the Oil Capitalists on the Copper Field—Will the Octopus Apply its Oil Methods to Mining?—Freedom within the Oil Monopoly—Thousands of Miles of Pipe Lines—Oil City in Early Days—The Era of Oil Scouts—Standard Oil Wages—Constable Hook and its Great Refinery.

About nineteen parts baseless rumor to one part scintilla of fact may be deemed the correct proportion in most stories afloat concerning Standard Oil operations in the copper industry. While, however, precise, particular facts have been hard to get at, it is not doubted that the group of capitalists roughly referred to as "the Standard Oil crowd" laid their plans months ago to acquire large blocks of stock in important copper companies, with a view to obtaining ultimately a strong if not controlling interest in the entire field of copper production. Their plans have not yet been crowned with complete success, and they cannot now be said to control the copper situation, or to exercise in that domain anything like their all-compelling sway in the oil markets. Nevertheless, they already own, wholly or in major part, numerous important mines, and they seem to be strengthening their grasp of the situation all the time. Under these conditions special interest attaches to a painstaking study of Standard Oil methods recently made by Charles M. Skinner. His article lately appeared in a number of places, but it is good enough to deserve another reproduction, in part, as follows:

OIL CITY NOTHING BUT OIL.

Oil City averts expectation and seems to defy scrutiny. Most of its 12,000 people ought to make oil, but they don't. They are pretty busy in the immense tube works, in the well supplying shops, in the railroad freight sheds, and they have to get out the Derrick and Blizzard, the two well-known and well-managed papers. Yet, oil is the principal source of pride, interest and income, and the chair warmers, with festoons of Florida moss under their chins, who congregate in the cheaper hotels and hold down the tops of cracker barrels in village groceries, are not talking about hay and turnips and shoats; they are bragging about their wells—or wailing over them, if they see a man coming in with a bill. Because thousands of these people own oil wells. Ah, yes, to be sure! You supposed the Standard Oil Company owned all the oil in America, but it does not. For example, in Ohio alone there are 700 oil firms and producers, and 4,700 employes, who receive $2,754,000 a year; yet they sell the product with enthusiastic unanimity to the Standard Oil Company, because that pays the highest price and does not pay in notes.

MANY INDEPENDENT OPERATORS.

Apart from the employes of this most monstrous of the trusts, 50,000 voters in the United States help to produce oil, and 30,000 of them operate wells of their own, either as individuals or companies. There are companies, too, in Wyoming, California, Canada and Mexico that have saved their independence, and the Standard Company has not bought the Russian oil fields—yet.

It all happened because the company was early on the ground and grew up with the country.

Now, either its men are afraid of it, and do not dare to speak, or slavery sits lightly on them, for the companies bitterest enemies are those who live farthest from it.

The Standard Oil Company is an aggregation of companies, some of which pump petroleum, some refine it, some extract its by-products, some own or operate tank-cars and steamers all over the world, and if one of these companies, or a prominent officer of a company, goes wrong, the Standard is held responsible by enemies of the trusts. It often has to divide itself up in order to get around anti-trust laws or to conform to State laws governing corporations. Thus, the piping of oil is done by the National Transit Company, New York Transit, Southwestern, Pennsylvania, Eureka, Southern, Northern, Crescent, Buckeye and Indiana Companies, each run as a separate organization, with its own officers and dividends—though the Standard Oil Company is the chief stockholder in each.

HOW CRUDE OIL IS PIPED.

Speaking of pipe lines few people realize their extent. There is a double line of eight-inch pipes extending from the Ohio field to Chicago, for instance; a double line of six-inch pipes from the same field to New York; a six-inch line to Cleveland; a four-inch line to Buffalo, while from the Pennsylvania field, bigger lines run to New York, Bergen Point, Baltimore and Philadelphia, the oil that goes into the great refining tanks in Brooklyn and Long Island City passing under the Hudson and East rivers and crossing Manhattan by a route concerning which secrecy is requested; it is so conspicuous. Now and then some captain of a schooner, disregarding the signs on shore, drops his anchor under one of those pipes, can't haul it up again, goes to the company, gets a warning and a new anchor and sails away.

It is no easy matter to send the millions of gallons of crude oil through these pipes to the lakes and the sea, because the average slope is slight and there are hills to cross. Hence, there are relays at intervals of 25 to 50 miles, to enforce the flow and overcome the friction of the viscid mass. At Price's Fork, Va., the oil has to be lifted over a mountain 1,594 feet high, and there are eighty pump stations on the trunk lines, employing about six men apiece. All of these pipes are deeply sunk in the earth, out of reach of frost and anarchs, and 135,000 barrels of oil a day flow through them, 16,000 other barrels going to shops and refineries on boats and trains. Every now and then the pipes become gummy with paraffine. It would cost a lot to dig them up, unjoint them and wash them out with mops and soap, so they don't do that; they insert at a pumping station a plug with metal scrapers, which is forced along by the flow of the oil and which frees the tube of paraffine, arriving at the next stand with three or four feet of dirty looking wax in front of it.

OIL CITY IN THE OLD DAYS.

The character of Oil City—the typical oil town—has radically changed in 30 years, and this change is largely due to the centralizing of the industry and its reduction to modern methods. Just after oil had been struck it was the same sort of place as Leadville became a dozen years or so later. Speculators and buyers swarmed in by boat and stage, prices were away up, everything was in a hurly-burly, the usual camp followers—the gamblers, confidence men, thieves and dealers in chain-lightning whisky—were early on the ground; dance halls, gaming houses and groggeries lined the main streets, there were noisy jubilations, bloody rows and violent deaths, men cheated and were cheated and hundreds were sorry they had gone there. All this has changed for the better. The town is turning itself into brick, has pleasant homes, handsome churches, good schools and a good hotel. The roads leading to it are possible for bicycles, but not probable, and some day it may clean its streets. It will also not be likely to suffer again from the misfortune that befell it in 1892, when a freshet in Oil Creek burst an oil tank and the liberated oil, spreading over the surface of the water, came in contact with a flame somewhere and rolled past the town a flood of fire which burned 57 people to death and destroyed houses and property.

PICTURESQUE OILDOM.

Although the people of this region are as American as you will find, the towns contain a considerable number of Irish and the Catholic faith is strong. Indeed, this part of the country was settled soon after the Revolution by the Scotch-Irish, who were a hard-muscled, stubborn set, fond of hunting and fishing, and good people not to quarrel with. On their lonely farms they seem to have degenerated in fiber, and when the oil fever seized them the average landowner was aptly described as a slow-going farmer who owned a shotgun and a yellow dog, and who, after he had struck oil, devoted his time to sitting on a barrel in a grocery. But the rush of keen-witted people into the region had the effect of brightening the natives, and in their business dealings they developed the shrewdness and aggressiveness for which they were famous. They began to work, and many of them made money. Towns grew over night and railroads began to pierce the shaggy, lonely land. At first Titusville floated her old barrels in flatboats down Oil Creek, and so to the Allegheny River and down that stream it pursued a devious course to Pittsburg—devious, because it probably winds oftener to the minute than any other stream in America. It cost $2 to send a barrel of oil by steamer to Pittsburg then, and $5 to send a passenger, though he had a berth and meals. Now the steamers have disappeared from the upper Allegheny.

THE ERA OF THE OIL SCOUT.

As a result of this activity so many refineries sprang up that they could work only one day in the week, and the oil produced in many of them was not only poor as to lighting quality, but dangerous. Standard oil nowadays is of at least 150 degrees flash test, which means that it will not take fire from a spark until it has been heated to 150 degrees.

The oil markets of cities were in those days often "rigged" by speculators who employed scouts. It was the duty of these scouts to find out where strikes were made and report as quickly as possible. A big strike meant a cheapened product, and that was a warning to gamblers in stock to sell. A failure in a region on which hopes had been erected meant a rise in stock, hence came the warning to buy, quick. In order to keep these scouts at a distance, many of the companies surrounded their precincts with a regular military guard, armed with Winchester rifles, and the scout had to be cautious. He would snoop around in the twilight; he would climb trees when a well was to be "shot" or torpedoed, that he might guess at its probable yield from the geyser that came up in the first gush of oil, and he would then scramble to the nearest telegraph station and wire his news.

GROWTH OF THE OIL FIELDS.

In those days 45,000 people lived in the valley of Oil Creek, and the tankage at so presently inconspicuous a place as Olean, N. Y., was 4,000,000 barrels. Wells were producing at a rate that promised everlasting wealth for their owners and people would not listen to any talk of their playing out. Now, with 69,000 wells in operation in the oil region a couple of barrels a day is regarded as a satisfying yield; but this region has grown. It begins in Southern New York, runs southwest through Pennsylvania and West Virginia, then reaches into Ohio and Indiana. It lies parallel with the Allegheny range, and from 25 to 50 miles distant. Burning Springs, W. Va., is called the southmost point, and thirty years ago it was productive ground. It is not much regarded now, although new wells have recently been drilled there. Of all this vast area the Standard Oil Company owns a third. In the rest of the region it buys from the well owners or renters—because sometimes the farmer with oil under his potatoes has not the money for making experiments, and he leases the right to drill on his land to a more pecunious or speculative person. In that case, if oil is struck, the farmer gets as rent, or royalty, one-eighth of the product.

Apart from the effect of the church on daily life the moralities of the district are improving. All trace of the days of wild cat wells have disappeared; there is only a customary amount of loafing and drinking in the towns, the oil scout and prospector have no employment, and there are no gambling houses or dance halls. The liquor laws are more rigidly observed in Western Pennsylvania than in most other parts of the country, and Sunday closing is not a mere form.

WAGES OF STANDARD EMPLOYES.

The lowest wage paid by the Standard Oil Company is given to its laborers, and is $1.50.

The men who screw pipe together and handle the big tongs in which the pipe is turned make $2.50 a day. They have to be men of skill in their specialty, for they must know whether or not an end is threaded right and will make a tight joint. The connection men who help the tong men at the wells and lay pipe from the well to the tank make $60 a month. Still better paid are the gaugers, who measure the oil at the various tanks, gauging by quarter inches, and reporting to the company, which then credits up on its books the oil which it buys.

The foremen earn $125 a month and the superintendents, of whom there are nine, make $2,400 a year. In the refineries and works where paraffine, lubricants and other by-products are made the average daily wage is $2. The laborer gets $1.50, the ordinary mechanic $2.77, but the extraordinary mechanic makes $4.50.

THE LARGEST REFINERY IN THE WORLD.

No man is employed who smokes or drinks. He would be as dangerous among the gases and inflammable fluids as a box of matches in a powder mill.

Constable Hook, a cape rising a few feet above the marshes below Jersey City and surrounded by the tide mud and the City of Bayonne, has the largest refinery in the world. It covers something like 300 acres and presents to view a labyrinth of tanks, stills—neither the tanks nor stills that witlings will think of—derricks, sheds, shops, pipes, engines, tracks, trains, pumps, and is filled with solemn, awe-inspiring smells. There are over 3,500 men in all departments, and the work goes on night and day, to the mighty dis-

tress to the folks over on Staten Island, who breathe smoke and gas and the characteristic odor of decayed garlic, and who dare not go in swimming for fear of being poisoned by the sludge acid that purls along the surface of the Kill von Kull. Still, oil has to be refined somewhere, and by general consent of almost every other place it is made at Bayonne.

The Age of Aluminium.

Nikola Tesla Declares that Aluminium will Absolutely Annihilate the Copper Industry, and May Ultimately Conquer Even Iron.

To the June number of the Century magazine, Nicola Tesla contributes an article that will create profound discussion. Among other startling assertions he predicts the doom of the copper industry, which will be supplanted in his opinion by aluminium at a time not far distant. Iron also, he thinks, has before it a fierce struggle for existence with the wonderful new metal, with the chances by no means preponderantly favorable to the present king of metals.

With the advances made in iron of late years, Tesla says, we have arrived virtually at the limits of improvement. We cannot hope to increase very materially its tensile strength, elasticity, hardness, or malleability, nor can we expect to make it much better as regards its magnetic qualities. More recently a notable gain was secured by the mixture of a small percentage of nickel with the iron, but there is not much more room for further advance in this direction. New discoveries may be expected, but they cannot greatly add to the valuable properties of the metal, though they may considerably reduce the cost of manufacture. The immediate future of iron is assured by its cheapness and its unrivaled mechanical and magnetic qualities. These are such that no other product can compete with it now. But there can be no doubt that, at a time not very distant, iron, in many of its now uncontested domains, will have to pass the scepter to another; the coming age will be the age of aluminium. It is only seventy years since this wonderful metal was discovered by Woehler, and the aluminium industry, scarcely forty years old, commands already the attention of the entire world. Such rapid growth has not been recorded in the history of civilization before. Not long ago aluminium was sold at the fanciful price of thirty or forty dollars per pound; to-day it can be had in any desired amount for as many cents. What is more, the time is not far off when this price, too, will be considered fanciful, for great improvements are possible in the methods of its manufacture.

THE DOOM OF COPPER.

The absolutely unavoidable consequences of the advance of the aluminium industry will be the annihilation of the copper industry. They cannot exist and prosper together, and the latter is doomed beyond any hope of recovery. Even now it is cheaper to convey an electric-current through aluminium wires than through copper wires; aluminium wires cost less, and in many domestic and other uses copper has no chance of successfully competing. A further material reduction of the price of aluminium cannot but be fatal to copper. But the progress of the former will not go on unchecked, for, as it ever happens in such cases, the larger industry will absorb the smaller one; the giant copper interests will control the pygmy aluminium interests, and the slow-pacing copper will reduce the lively gait of aluminium. This will only delay, not avoid, the impending catastrophe.

MUST IRON ALSO GO?

Aluminium, however, will not stop at downing copper. Before many years have passed it will be engaged in a fierce struggle with iron, and in the latter it will find an adversary not easy to conquer. The issue of the contest will largely depend on whether iron shall be indispensable in electric machinery. This the future alone can decide. . . . . The seemingly insuperable difficulties which are now in the way may be overcome in the end, and then iron will be done away with, and all electric machinery will be manufactured of aluminium, in all probability, at prices ridiculously low. This would be a severe, if not a fatal, blow to iron. In many other branches of industry, as ship-building, or wherever lightness of structure is required, the process of the new metal will be much quicker. For such uses it is eminently suitable, and is sure to supersede iron sooner or later. It is highly probable that in the course of time we shall be able to give it many of those qualities which make iron so valuable.

AN INDUSTRIAL REVOLUTION IMPENDING.

While it is impossible to tell when this industrial revolution will be consummated, there can be no doubt that the future belongs to aluminium, and that in times to come it will be the chief means of increasing human performance. It has in this respect capacities greater by far than those of any other metal. I should estimate its civilizing potency at fully one hundred times that of iron. This estimate, though it may astonish, is not at all exaggerated. First of all, we must remember that there is thirty times as much aluminium as iron in bulk, available for the uses of man. This in itself offers great possibilities. Then, again, the new metal is much more easily workable, which adds to its value. In many of its properties it partakes of the character of a precious metal, which gives it additional worth. Its electric conductivity, which, for a given weight, is greater than that of any other metal, would be alone sufficient to make it one of the most important factors in future human progress. Its extreme lightness makes it far more easy to transport the objects manufactured. By virtue of this property it will revolutionize naval construction, and in facilitating transport and travel it will add enormously to the useful performance of mankind. But its greatest civilizing potency will be, I believe, in aerial travel, which is sure to be brought about by means of it. Telegraphic instruments will slowly enlighten the barbarian. Electric motors and lamps will do it more quickly, but quicker than anything else the flying-machine will do it. By rendering travel ideally easy it will be the best means for unifying the heterogeneous elements of humanity.

California Hydraulic Mines.

The law recently passed by Congress making available funds for the construction of debris dams in California, means much for miners. Under the famous Bloomfield decision all the hydraulic mines in the drainage basins of the San Joaquin and Sacramento rivers were absolutely prohibited from working, and were all closed down by injunctions of the courts. This ruling, of course, cut off the supply of gold from this class of mines, throwing thousands of men out of employment. Through the agency of the California Miners' Association the Cammetti law was passed, which under certain restrictions permitted most of these mines to resume. The restrictions were that each mine must, at its own expense and under the supervision of a Government commission of engineers, impound its debris and prevent the same from getting into navigable streams or upon adjacent lands. Since the law was passed between 200 and 300 of these mines, previously closed down for years, have resumed operations, having built the necessary impounding dams to hold back the debris. It is true that the output is to some extent restricted, because they cannot wash as much gravel behind barriers as when they could do as they pleased with their tailings, it being necessary to let the muddy water settle in the reservoirs. Still, none of these mines could work before the law was passed, and not all can do so yet. If they do not build restraining works to the satisfaction of the Government engineers.

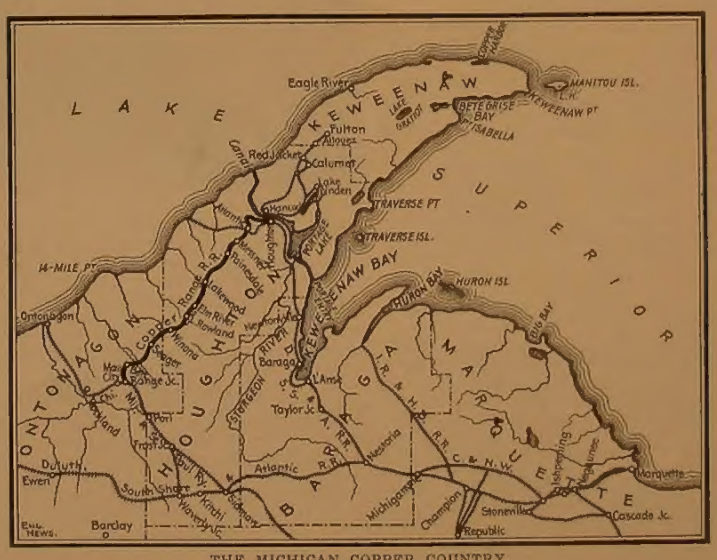
It was in 1888 that impounding dams for debris were recommended by Congress. Ex-Governor H. H. Markham, in his inaugural address of 1891, called the attention of the Legislature to the hydraulic mines and suggested a thorough investigation, maintaining that the Federal Government should bestow the same attention to mining as it had to irrigation. Resolutions were passed by the Legislature asking Congress to appoint a commission to be sent to California, for the purpose of investigating hydraulic mines and rivers, and taking such action as it thought necessary to enable the hydraulic mines to resume operations.

Among other things accomplished by the California Miners' Association since it began its work is the obtaining of two important appropriations for the improvement of rivers, to prevent the debris already in them from coming further down and injuring navigation. The State Legislature appropriated $250,000 for this purpose, on condition that Congress appropriate a like sum for the same purpose; and after zealous, laborious efforts on the part of the Association Congress took the desired action.

Increased Copper Production in the South Range.

The great copper mines in the North Michigan district—the Calumet and Hecla, the Tamarack-Osceola, and the Quincy—are all located north of Portage lake. The Atlantic and the Baltic mines are south of the lake, and in all likelihood numerous other producing mines can be developed in Ontonagon and Houghton counties along the South Range. Mines have been opened in this district in the past, but lack of transportation facilities has hindered, and in some cases stopped, substantial progress.

This barrier to effective development has now been removed by the building of the Copper Range Railroad. Beginning at Houghton, the road mounts the range on a skilfully engineered 2% grade and runs southwest along the crest of the mountains, through Atlantic, Lakewood, Winona, and other towns to Range Junction, forty-one miles distant, where it connects with the Ontonagon branch of the Chicago, Milwaukee & St. Paul R. R. The high price of copper and the shipping facilities afforded by the new road have stimulated production greatly in the region served by the road, several old mines and a number of new ones having been started up in recent months. While the South Range can hardly hope to rival Keweenaw Point as a producing center, it seems likely that a well-settled and prosperous mining region will quickly develop from Portage Lake to Range Junction. An excellent map of the Michigan copper country, showing the route of the new road, is here reproduced through the courtesy of the Engineering News.



THE MICHIGAN COPPER COUNTRY.

Wanted—A Few Addresses.

Where are the Big Klondike Companies?—Some Mysterious Disappearances—Will it all Happen Over Again This Year?

The city editor of the New York Sun recently picked out one of his smartest reporters and told him to go down to Wall street and see if he could locate some of the big Klondike mining companies, which three years ago were filling the advertising columns of the newspapers and covering many acres of good stationery with glowing descriptions of their wonderful mines in the then newly discovered gold fields. In the course of time the reporter returned to his city editor and told him that out of a dozen addresses given him he could not find one of the companies. Ordinarily, when a reporter brings in this kind of a report on his assignment, his name very suddenly drops from the pay roll, but this was not the case in this instance, for the young man backed up his statements with the testimony of so many janitors, elevator men and directories that he was told to write a "spread story" on what he could not find. This is part of what he wrote:

Of a dozen Klondike companies taken at random from a list of those which were occupying fine offices in this city in 1897 and promising large returns upon the capital invested, not one could be found to-day at the offices formerly occupied by them. The British North American Trading and Exploration Company, "with a capital of $5,000,000, full paid, shares $1 each, non-assessable," is no longer in its offices at 63 and 65 Wall street; and when "Gen. B. M. Whitlock, president," and "Alexander A. Arthur, secretary," left the building soon after the Klondike boom, they took no pains to keep the address of their new office in the public eye.

The Yukon Trading, Mining and Exploration Company, "capital $1,000,000, shares $1 each, full paid, non-assessable shares," is no longer at 15 Wall street, and when it left no word was given by its officers as to where the company's new offices could be found. Charles S. Hartwell was president; William T. Criswell, vice-president, and the Hon. Charles A. Keeler, secretary and treasurer.

The Munina-...aska Gold Mining Company, "capital stock $1,000,000, shares $1 each," is no longer at its fine offices, No. 11 Broadway; and "Denslow, Ward & Co., bankers, No. 11 Broadway," who were handling all the cash for the concern, are no longer at No. 11 Broadway, and the superintendent of the building has no record of the situation of their new offices.

"New York and Alaska Gold Exploration and Trading Company" was the name of another bonanza concern, which had offices at 44 and 46 Broadway, and "a capital of $1,000,000 of non-assessable stock, valued at $1 per share." It is no longer at 44 and 46 Broadway, and the janitor does not know where the company can now be found.

The "Norse-American Gold Company, Limited," with a subscription of $750,000 of its capital stock at $100 a share through Roe & Barnes, 55 Broadway, would be difficult to find to-day, because it is no longer at 55 Broadway, and Roe & Barnes are no longer in the directory of that building. The janitor does not know where the concern has gone.

"The Kootenay-Caribou Mining and Investment Company, Limited, incorporated under the laws of the Province of British Columbia, 1862, capital $2,500,000, shares $1 each," is no longer doing a rushing business in this city at its old offices, 60 Liberty street. The superintendent of the building said he thought it must have moved back to Canada if it did not go out of existence altogether.

City editors of newspapers are not the only ones who have for a year or two been trying to find some trace of the score or more of evaporated Klondike companies. The number of persons who would like to have some information about the companies, and more particularly about the money they poured into them, would make up a big item in the forthcoming census report. The Census Bureau would perform a great service to humanity if it would instruct its enumerators to gather information on this point and also to ask the poor unfortunates who plead guilty to the charge of investing whether they ever heard from their money after they received their "stock certificates."

But it would happen all over again when the next time came around for a Klondike craze or the corresponding accompaniment of a new gold discovery. The investment mania is likely to be one of the most violent forms of the Cape Nome fever, breaking out in spots all over the country where people with comfortable savings bank accounts who cannot run away from home, want to get a share of the marvellous wealth which the philanthropists who are organizing the big "companies" are offering to distribute all over the world.

An Efficient Coal Pulverizer.

One reason why American coal is making such inroads on European markets may be found in the superiority of American coal-mining machinery. As an example in point, reference may be made to the Williams Patent Coal Pulverizer.

Taking nut and slack coal just as it comes from the cars, this machine will reduce it in a single operation to a finished product. It pulverizes the coal without any drying, and the blast generated by the machine blows the material into a rotary kiln or stationary furnace. An automatic attachment regulates the feed and amount of pulverized material. The machine is further equipped with air gates, the same as a blast fan, which allows the operator to take in air and increase the blast according to need.

In cement plants the Williams Pulverizer has proved very efficient when used in connection with rotary kilns. The coal is dumped into large storage bins behind the machine, and flows thence gradually into the hopper first, the automatic feeder next, and the machine at last. When pulverized, the coal is blown into the furnace and ignites with the flame. One large cement plant, which is now using two of these machines on its rotary, is saving, according to the statements of the managers, 20 per cent per barrel over the cost of production when the cement is burned with oil.

The Goldfield Power Plant.

Some other mining districts might profitably consider the La Bella power plant at Goldfield, Colo., in the famous Cripple Creek district. By means of this central plant consumers, particularly small ones, obtain their power much more conveniently and much cheaper than they could by individual installations. Besides electric light and power, the plant supplies compressed air and water. The electrical output is furnished within a radius of six miles, and is used principally for hoisting, pumping, and ore crushing in the mines. The compressed air is distributed within a radius of two miles, and is supplied for air drills, blacksmith's forges, and for ventilation. The air requires ten miles of pipes for its distribution. The water supply is pumped from a spring to the mines, and is used chiefly for ore washing. The plant lights the entire district, including the cities of Cripple Creek, Victor, Goldfield, Independence, Aultman and Anaconda. The Cripple Creek District railway is also operated from the plant.

The Climate of Nome.

Far from Tropical, but Not Altogether Arctic—75° Above in July, 55° Below in February—A Fine Country for Ducks.

So many contradictory reports have been made concerning the climate of Nome—some of them likening it to the balmy Mediterranean and others to polar frigidity—that we print below an extract on the subject from an official report to the United States Geological Survey. The climate of Seward Peninsula, according to this trustworthy authority, is milder and much more even than that in the same latitudes in the interior of Alaska, or the Yukon country. The precipitation, also, is considerably greater. The summer is not so warm nor the winter so cold. The sea, here traversed by a branch of the Japanese Current, is the great moderator. According to the records of the Weather Bureau, the mean annual temperature at St. Michael is 26.1° F., and the annual precipitation (rain and snow) 14.44 inches. The extremes of temperature noted on the island are 76° F. in July and 55° F. in February. The records show freezing temperatures every month except July. The most reliable data indicate that the temperature at Nome is usually somewhat lower than at St. Michael, and that the precipitation is about the same. The winters, as noted, are not so cold at Nome as in the Yukon Basin,

A TYPICAL SCENE ON THE NOME BEACH—FALL OF 1899.

but are more trying, because of the dampness and of the cold winds, from which there is no shelter.

The summer, which is short and generally cool, resembles spring in the northern United States. During the warmer months many bright, clear days occur, but the mountains are usually overhung or obscured by vapory clouds, which presage rain. Rain is of frequent occurrence, often continuing steadily for several days, but it is not usually accompanied by wind. Dense fogs, however, are not common. The prevailing summer winds are from the south. Vegetation attains its maximum growth in late July and early August, when verdure and wild flowers abound, and give a great variety of colors; but they do not flourish long, for scarcely has the season emerged from spring and the snow disappeared, when it passes into fall, with its nipping frosts, indicative of the approaching winter. In summer the days are long. From May to early July it is daylight nearly all the time, with night scarcely perceptible at the time of summer solstice, about the 21st of June. In August the length of the day begins rapidly to decrease.

The winters will probably average ten or more degrees milder than at the Fortymile and Klondike region, in the same latitude in the interior. They are not much colder than in some parts of the United States. The minimum temperature or greatest cold seems to occur at about the middle of January, at which time the thermometer rarely descends to more than 30° below zero. From late

October to early April, however, for a period of nearly six months, there are said to be but few days on which the thermometer rises above the freezing point. Snow begins to fall on the mountains early in September and on the low country along the coast about the middle of that month. Blizzards are frequent. They begin early in November and are usually of several days' duration, but some have been known to last for as many weeks in the month of February. They generally come from the north or northeast. The snowfall is not heavy, but the snow drifts greatly. It comes with the prevailing winter winds, which are usually from the north or northeast, especially the latter. A west wind denotes clear weather, during which the display of northern lights is said often to be sublime. The fallen snow is peculiarly dry-frozen, so that pieces of it when stuck together give a clinking, metallic sound. The ice attains a thickness of from four to five feet, but Bering Strait, the channel between Seward Peninsula and Siberia, is rarely, if ever, frozen over by a continuous sheet of ice. Only rarely can the Diomede Islands, in the middle of the channel, be reached on the ice. Along the shore solid ice usually extends out from five to six miles, beyond which is open water with fields of ice drifted about by the wind. Even in the coldest weather the natives go out to this open water to hunt seal, and nearly every year some of them are carried away and almost perish from starvation before the ice field drifts so as to enable them to leave it and reach the shore. In the spring, water begins to flow in the creeks and rivers toward the latter part of May, about the same time that the ice breaks up in the Yukon country. The Nome coast is free from ice earlier in the spring and later in the fall than the coast about St. Michael Harbor, but usually the fields of drift and shore ice do not sufficiently disappear to permit the approach of vessels before the 10th of June. It begins to form again about five months later, so that vessels should not count on leaving the region later than early November. Where played upon by the wind and tide, the drift ice is said often to pile up to a height of several hundred feet along the shore.

The climate, though for the most part moist and rainy, may be said to be generally healthful in summer, but rather harsh and severe when cold weather sets in, so that severe colds and pulmonary troubles, especially pneumonia, are common. Drainage and water supply last season was poor, so that typhoid fever, often complicated by pneumonia, was common and not rarely fatal. About the middle of last October there were reported to be about three hundred cases of typhoid and pneumonia in the Nome region.

Gold Ores of the Black Hills, South Dakota.

$7,000,000 Annually Produced—Little Uncertainty in Prospecting for Siliceous Ores—Four Reducing Plants—Three Companies.

By H. M. Chance, Philadelphia, Pa.

Probably no other prosperous mining district is so little known as the Black Hills. The name leads one to assume that the district is a rolling country, consisting of more or less insignificant hills. Nothing could be more untrue, as the Black Hills is an elevated region rising to heights of 7,000 and 8,000 feet above sea-level, and broken by deep gorges and ravines. It is, in fact, a mountainous country in all that that term implies; but the canons and gorges are of such a character that the country is easily penetrated by railroad-lines, and good wagon-roads exist to-day, affording access to every portion of it.

Aside from the stampede to the Black Hills country in 1876, when gold-placers were discovered, and 15,000 or 20,000 people became infected with the mining fever, the region has never had a mining "boom."

Quartz-mining commenced in 1877 or 1878, and has been successfully prosecuted ever since; the output of gold steadily growing, until at present the yield is about $7,000,000 annually.

This great production is about equally divided between two entirely different classes of deposits. The first class, comprising the so-called quartz or free-milling ores (of which the Homestake mine is the principal producer), are veins of generally steep dip, in the older metamorphosed rocks, and similar to the veins worked in other mining districts. The second class of mines is located in what is known as the "siliceous gold-belt."

THE SILICEOUS GOLD BELT.

This belt lies in the immediate vicinity of Deadwood and Lead City, and covers an area six or seven miles in length by three or four miles in width. The formation in which the siliceous ores are found is a nearly horizontal series of sandstones and shales, generally referred by geologists to the Potsdam period. These shales and sandstones were not originally gold-bearing rocks, but they have been cracked and fissured in all directions, and through these cracks and fissures gold bearing solutions have permeated the formation giving rise to a series of ore-chutes of variable width and thickness, and so numerous that the formation is literally riddled with chutes of ore. These ore-chutes are usually horizontal, and commonly extend for considerable distances in nearly straight lines, following the lines of fissure through which the ore-bearing solution has found its way into the formation.

Within certain limits of the developed area of this formation the formation is so completely mineralized that it is next to impossible to sink a shaft more than thirty, forty, or fifty feet, or to drive a drift, upraise or winze for the same distance, without striking ore. In other words, the uncertainty which usually attends prospecting for ores seems to be almost entirely eliminated, as ore is found in every tunnel or shaft.

Most of these ore-chutes yield ore ranging in value from $10 or $12 up to $15 per ton; some average $20 or $25 per ton; others have been found ranging in value from $30 to $100 per ton; and the general average value of ore found in this formation is from $12 to $18 per ton. Of such ore, the quantity is at present incalculable, as will be understood when it is considered that we have here a formation, 300 or 400 feet thick, with ore-chutes and ore-horizons scattered through it from top to bottom, in some places close together, in others more widely separated; that this condition obtains over an area of say four miles long by two miles wide; and that the chutes are of variable width and thickness, so that, while it is not possible to make any statement as to the average width or average thickness, it is evident that the quantity of ore embraced within these limits is enormous.

A UNIQUE GOLD-BEARING FORMATION.

This siliceous gold-belt of the Black Hills seems unique as a gold-bearing formation. I do not know of any other district in the world where such a series of deposits has been discovered. There is no other district, except, perhaps, the South African gold-fields, where shafts may be sunk with the certainty that here obtains of striking ore. This is so thoroughly understood by the owners of the reduction-plants that they have bought a large area of practically undeveloped territory. Claims, often entirely barren of all evidence of ore, have been purchased as confidently as coal-operators purchase coal-land, with the assurance that, while the coal may not be visible, it will be found beneath the surface. The district has not produced any great bonanza-mines. Some ore-chutes have been found, yielding many hundreds or thousands of tons of ore, ranging in value from $50 to $160 per ton; and, before the reducing-plants were built, some of this high-grade ore was hauled by wagon 200 miles for shipment to works in Colorado; but these are exceptional instances. Most of the ore available in this district ranges in value, as already observed, from $10 up to $20 or $25 per ton.

REDUCTION WORKS.

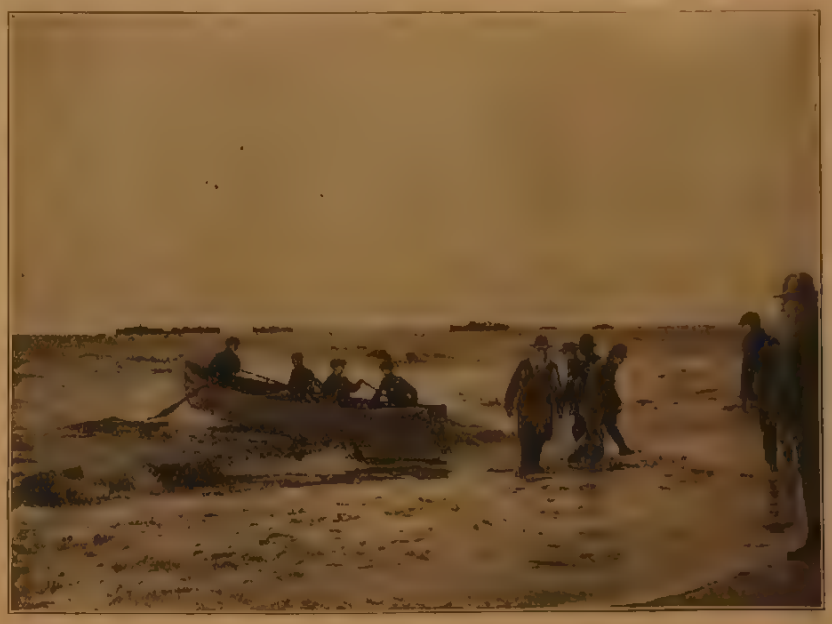
This belt now supplies ore to four reducing-plants, as follows:

1. The Deadwood and Delaware smelter, having a capacity of over 200 tons per day.
2. The Golden Reward chlorination-mill, with a capacity of about 180 tons per day.
3. The Horseshoe Mining Co.'s (Kildonan) chlorination-mill, with a capacity of 120 tons per day.
4. The Black Hills Reduction Co.'s cyanide-mill, with a capacity of sixty tons per day.

Reducing Processes: The ores of this belt are successfully treated by smelting, by chlorination, and by the cyanide process; and the ability to treat them successfully and profitably both by straight smelting and by pyritic smelting is demonstrated by the Deadwood and Delaware smelter, which uses both processes.

Cost of Mining and Treatment: The cost of smelting under the conditions obtaining in this district probably ranges between $4.75 to $5.75 per ton; the cost of chlorination is about $3.50 to $4.50 per ton; and the cost of treatment by cyanide is, thought to be somewhat less, possibly $3 to $3.75 per ton. The location of reduction-works at a point where water-power might be used instead of steam-power would reduce the cost of treatment by the cyanide and chlorination processes about fifty cents per ton.

Notwithstanding the fact that ores can be treated at the low cost above stated, the metallurgical works charge for reduction $9 per ton, which, with the railroad-freight of seventy-five cents per ton from the mines to the works, brings the cost for freight and treatment up to $9.75 per ton. Individual miners, and operators working in a small way, getting out but a few tons of ore per day, generally find that the cost of mining, including deag-work and improvements necessary from time to time, brings the cost of the ore, delivered upon the railroad cars, up to about $4 or more per ton. This, added to the cost of transportation and reduction, practically leaves no margin of profit on ores averaging less than about $15 per ton. As the assay-returns from the reduction-works rarely show as large values as those obtained from assays of miners' samples, the miners of the district do not, as a rule, at-



LANDING AT NOME THROUGH THE BREAKERS

tempt to mine ore that does not show by their own samples an average value of at least $16 or $17 per ton.

Profits: The owners of the reduction works can profitably treat ores from their own properties that do not yield more than $10 per ton. Now, it is precisely between these limits of $10 and $17 per ton that the values of the largest bodies of ore range; and there is in sight, in the district, probably five or ten times as much ore ranging in value from $10 to $17 per ton as can be found exceeding $17 per ton. It is, therefore, self-evident that so long as the high treatment-charges obtain, mine-operators, in order to reap anything like the full measure of possible profit, must own and operate their own reduction-plants. This fact is now well understood by those familiar with the district, and is appreciated very fully by the owners of the several reduction-works already mentioned.

THREE SUCCESSFUL COMPANIES.

Probably two-thirds of the developed area within this siliceous ore-belt has already been purchased by the three great companies operating in the district, namely, the Deadwood and Delaware Smelting Co., the Golden Reward Consolidated Co., and the Horseshoe Mining Co. The plants of these companies were all started in a small way, from six to ten years ago, and, after more or less checkered careers, have solved the problem of efficient and economical treatment of the ores, and have grown from small beginnings to their present capacity. From the very outset they have all been steadily enlarging their capacity, and are still continuing to enlarge it; they have all been buying additional territory, and are continuing to buy such territory when it can be purchased at what they regard reasonable prices; so that each one of these companies now controls a very large area of mining ground in this siliceous ore-belt.

What these companies have accomplished others may now duplicate without passing through the period of experiment and uncertainty which each one of these enterprises was forced to pass through before solving the problem of economic and successful ore treatment.

The district is well supplied with transportation facilities by the Chicago and Northwestern and the Chicago, Burlington and Quincy railway-systems. Ample water for power and all other purposes is furnished by streams immediately adjacent to the mills and but a few miles from the mines. Water sufficient for chlorination or cyaniding is available at almost any point at which it might be desired to locate such works.*

The Thermo-Hyperphoric Process.

After nearly three years of honest endeavor and the expenditure of no inconsiderable amount of capital, says the Australian Mining Standard, the Rev. Joseph Campbell, the inventor of the thermo-hyperphoric process of ore reduction and gold extraction, has to admit failure. This means a great disappointment to those interested in low-grade refractory propositions, and to those who, from a purely scientific standpoint, have watched the course of treatment adopted by Mr. Campbell with much interest. That the process was not based on false principles, and that the hopes of its success were reasonably founded, is a fair conclusion. First, it is a fair conclusion from the results actually obtained from other ores treated by this method; and, secondly, it is justified by the confidence which many New Zealanders entertained in the outcome. Competent observers watching developments on the spot were impressed with the prospect of success.

EXPLANATION OF THE PROCESS.

The principal feature of the process is the passing of water-gas, which is a mixture of hydrogen and carbonic oxide (carbon mon-oxide) through the roasted ore at a temperature of 2,000 degress Fahr. Mr. Campbell holds that these two gases, mixed, act much more powerfully than in a separate state, and that the result is that the tellurium, arsenic, sulphur, etc., or various compounds of them, are eliminated, and a perfectly sweet roast is obtained. He claims that the process succeeds where cyanide and chlorination fail, and that in cases where they are successfully employed it is also efficient, but at a cost of from 50 per cent to 75 per cent cheaper than either. Another advantage claimed for Mr. Campbell's process is that the whole treatment is accomplished in the case of most ores within three hours. Mr. Campbell states that he has not met with a single ore in Australia, New Zealand, America, or South Africa, that he has not been able to treat with perfect ease, saving 90 to 95 per cent of the gold, at a cost which, upon a large scale, would only amount to 5s. or 6s. per ton, supposing labor conditions and fuel supply to be favorable. The details of the process are that the ore is crushed to about a ¼-inch mesh, then roasted in an automatic sealed furnace, and, whilst roasting, water-gas, as above described, is passed through it. Afterwards the ore passes into mills of a special type, which are made in America, and thence into amalgamators of recent construction.

THE CASE NOT HOPELESS

It is, of course, evident that in confessing present failure Mr. Campbell does not regard it as a failure of the process, but merely as its failure to obtain remunerative results from a particularly refractory low-grade ore, the metallic contents of which will not pay for the cost of extraction. It has failed to make the Te Aroha ores pay, and therein it has disappointed the hopes with which their treatment was entered upon, and has falsified the very firmly expressed predictions of its orignator. But Mr. Campbell's explanation is that the ores are too low-grade to be worked with financial success unless local fluxes can be effectively employed. Ore containing silver worth from 12s. 6d. to 15s. per ton, with a trifling quantity of gold, is too poor to warrant the use of imported fluxes, and he sees no prospect of obtaining local substitutes. This is an understandable statement, which only leaves it to be explained how the experiment came to be made on ore whose chief value would seem to lie in its near approach to absolute freedom from auriferous and argentiferous impurities. Still, it is permissible to assume that with higher grade ares, the process may give profitable returns, only the higher that grade the lower the merit of remunerative extraction. For the present, however, the result is a blank, and the thermo-hyperphoric process has yet to demonstrate its value on a comprehensive and practical scale.

*Extract from Paper at Washington Meeting of American Institute of Mining Engineers.

More Copper From the Southwest.

One of the richest copper-producing sections in the Southwest, if not in the United States, will be developed and made tributary to Los Angeles by the new Santa Fe and Arizona Southern Railway. The line will run for eighty miles due south from Seligman, on the Santa Fe Pacific, opening up Yavapai county, Arizona, from north to south and affording railroad facilities much better than any heretofore available for the great camps of Wickenburg, Weaverville, Yarnell, Date Creek, Congress, Kirkland, Skull-Valley, Granite Mountains, Hillside, Kendrick Mountains, Hope and Gemini Peaks, Anvil Rock, and other places.

The Santa Fe, Prescott and Phoenix Ry, covers the southern portion of the county pretty thoroughly, but the northern sections are isolated at present. The new Arizona Southern line, running through a rich virgin country, will develop the region into a prosperous mining and industrial center.

The new company began construction March 14 last. Officers and directors were recently elected as follows: Wm. F. Botsford, president; Edw. J. Carter, 1st vice-president and general manager; James C. Talmage, secretary and treasurer; John M. Miller, general counsel; Michael C. Healion, of San Diego, Cal.; Homer C. Wood, of Prescott, Ariz.; and Colin Trimmons, of Kingman, Ariz. The general officers are all residents of Los Angeles, and the headquarters of the company will be permanently established in that city.

Mining Companies and the Bankruptcy Law.

A precedent in bankruptcy proceedings was established in the Federal Court in Kansas City, Mo., on June 9, when Judge Corland ruled that companies engaged principally in mining are not subject to the bankruptcy law, inasmuch as they are not "engaged principally in manufacturing, publishing, trading or mercantile pursuits," as a section of the law provides must be the occupation of persons, companies or corporations to be subject to bankruptcy proceedings.

The decision was rendered in the case of the Victoria Zinc Manufacturing Co. of Oronogo, Mo. After this company had installed a new mill costing $72,000, the machinery contractors becoming preferred creditors, other creditors attempted to force the company into bankruptcy and defeat the preferred claims of the machinery men.

Influence of Railroads on Mining.

Copper and Silver Mining Especially Benefited Coal Reciprocally Important—The Pacific Roads Double our Area—A New Type of Citizen.

By James Douglas, LL.D., New York City.

The influence of the railroads on mining has not been more important than the reciprocal influence which the mining industry has exerted on the railroads. The first interests to receive a stimulus were the lead mines of Utah and Nevada, on the completion of the Union and Central Pacific railroads. Shipments of the richer argentiferous lead ores preceded smelting up to the years 1872 and 1873, even as the shipments of the richer copper ores of Montana were made in advance of the advent of the Utah and Northern Railroad into Butte. But not until the metallurgist came to the assistance of the miner, and the railroads supplied moderately cheap fuel, did the West become the controlling factor in the production of copper and silver which she is to-day in the market of the world.

The beginnings of gold and silver mining in the Eastern range of Colorado antedate the arrival of the railroad; but only when the Union Pacific system reached Denver could the sulphurets of Gilpin county be smelted into mattes, or the refractory ores of Clear Creek county be advantageously treated. At first Senator Hill, at his furnaces in Black Hawk, used wood as fuel; but the necessity of coal for metallurgical treatment and for railway service became so urgent as to encourage the opening up of the coal fields in the eastern range of the Colorado Rockies. For a time Senator Hill shipped his mattes to England for separation; but a step in the direction of home treatment, like those which have marked the progress of both lead and copper smelting in the West, was taken when Richard Pierce introduced the Ziervogel method for the treatment of gold-bottoms, with modifications, into the works of the Boston and Colorado Co.

The discovery of Leadville and the active development of both mining and metallurgy in that direction were the most potent agents in stimulating railroad building, the exploitation of coal mines, and the manufacture of coke in Colorado. There alone in the West, moreover, coexist iron-ore, coke, and a market large enough to warrant the manufacture of iron and steel—an industry which everywhere has important reflex influence on railroad building and railroad prosperity. The raw material of iron manufacture is by no means confined to Colorado. The iron-ore deposits of Silver City, New Mexico, are both extensive and rich, but conditions are not yet favorable for the active economical development of these and other similar iron-ore bodies. There is coal in central and southern New Mexico, but the beds are so fractured and faulted as to have made mining heretofore less profitable than on the regular coal beds of the Raton range, both in Colorado and New Mexico. These afford the most available supply of fuel for both the locomotives and the furnaces of the southwest. The statistics of 1898 give the production of coal in Colorado as 4,125,206 tons; of coke in Colorado as 1,226,294 tons; and of coal in New Mexico, 1,416,980 tons. In fact, the coal-mining industry of the West, considering its scanty population, is even more active than coal mining in the Alleghenies. The Wyoming coal mines are credited with 4,006,756 tons. Montana's coal production has reached 1,900,000 tons, and the coal is of a quality which relieves the smelters from drawing any longer a notable supply from the Canadian northwest. Washington, even, contributes over 3,300,000 tons to the ever-growing demand. Thus these western coal-areas, so recently opened, contribute to the total of the country's fuel requirements about 15,000,000 tons, or nearly 12 per cent of the country's total production.

COPPER INTERESTINGLY TYPICAL.

Copper has been, after coal, the most essential auxiliary of all of the mining products to the Western railroads. Its bulk and the large proportion of fuel consumed in the reduction of its ores have made it one of the most valuable items of Western freight. At the same time the copper industry owes its origin and growth entirely to transportation facilities.

Though the Longfellow mine in Arizona smelted small quantities of ore with vegetable fuel, and shipped small quantities of copper for 700 miles to the nearest railroad station on teams which had brought merchandise into the valley of the Rio Grande, only the exceptionally high price of copper in the '70's permitted this. It was not until the Southern Pacific from the West, and the

Atchison, Topeka and Santa Fe from the North, made a junction at Deming, that the Bisbee, Clifton and Globe districts became notable producers So also, though small quantities of rich argentiferous ores were shipped from Butte to Corinne, on the Central Pacific, before the Utah and Northern was built, Butte did not rise into prominence as a copper producer until that road had reached Silver Bow county in Montana. Now, the copper industry of Montana must supply the railroads directly with about one million tons of long-haul freight in and out, and about two million tons of short-haul freight; and the Arizona copper industry gives them about half a million tons of long-haul freight. If the trade of the Pacific were always to be from West to East there would be a superfluity of transportation facilities; but the current is sure to turn, and ere long there will be a heavy freight traffic to Pacific ports. It is not reasonable, to take a single instance, that our Western copper should continue to be shipped from the middle West to the East and Europe, there to be manufactured into specialized shapes and sold to the Orient as India sheets, or in any other form. Coal, skill, transportation and shipping ports are ready to our hand, and the Western miner and metallurgist will ere long become a manufacturer, under the influence of these beneficent harmonizers of sectional interests—coal and railroads.

As we are a country of great distances, this is especially true. If coal were not widely disseminated, and fuel for our locomotives had to be hauled a thousand miles or more, our freight charges could not be, as they are to-day, the lowest in the world. And if coal were confined to a few and distanct regions, manufacturing could never have become, as it has, a common occupation of every section of the land; but the West would still be a grain producer, the South a cotton grower, and the metal and manufacturing interests would be confined to the Middle and North Atlantic States. As it is, thanks to the abundance of coal in Illinois, Chicago and other towns in that State are as conspicuous for their steel and other manufactures as Pennsylvania itself. The "New South," with its great coal resources in the Virginias, Tennessee, and Alabama, is to-day fixing for the older iron states the price of pig-iron, and is converting into textile fabrics her cotton in her own factories. This interfusion of manufacturing and farming is effectually correcting the old subdivision of the country into communities of opposing interests, and therefore of conflicting prejudices. Even what was till recently the "Far West" is entering the community of manufacturing states, owing to the possession of coal. Not only do coal and prosperity go hand in hand, but coal and politics are close allies.

SWIFT EXPLORATION AND DEVELOPMENT.

It was the discovery of gold in California, and the rush thither to reap a golden harvest without sowing any seed, which stimulated the peopling of the west coast; and it was the Mormon exodus from Illinois, the very same year, and the conversion, by these religious fanatics, of a tract of country in the very heart of the great desert into an oasis of beauty and fertility, which proved that the mountains would yield other products than the precious metals. Miners and Mormons were, therefore, the elementary material out of which Western life was originally composed.

While other elements have since been introduced, mining and ranching are still its staple industries, but both are pushed with an energy and intelligence beyond comparison. Western fruit, Western wheat, Western cattle, are feeding the world. For the rate of discovery and recovery of the precious metals, we have to look back to the years following the Spanish conquest of the continent, to find a parallel. The Pacific railroads have, to all intents and purposes, doubled the area of this country and Canada, and they have done it in the short period of thirty years. A region 1,000 miles wide by 2,000 long, rich in minerals, and utterly virgin ground, was scoured. It is practically bare of soil and unconcealed by forest, and therefore exploration has been easy and discovery rapid; but hardly more rapid than the avidity with which the discoveries, once made, have been utilized.

The statistics of the precious metals mined since 1849 afford proof of this. Between that date and 1898 the Rocky Mountains yielded about $4,500,000,000 in gold and silver. The Comstock lode alone produced from 1860 to 1880 $306,000,000 in gold and silver.

It is worthy of note that on the construction and equipment of the whole 40,000 odd miles of railroad in the Rocky Mountain system there has been spent more than one-third the total production of the precious metals.

Despite the relatively small value of copper, its mining and reduction have been pursued with the same haste, a haste which, in this case as in that of the precious metals, has necessarily involved a heavy waste. The great copper mines and smelting plants designed on such a stupendous scale have been the controlling factors in the world's copper market for the last twenty years. The quantity of copper they have turned out has been approximately 3,500,000,000 pounds.

NEW CONDITIONS CREATE NEW RACE

But the men themselves have had almost as powerful an influence on the world's history as the production of their hands and brains has had on the world's markets. The isolated outdoor life passed by the herdsmen, prospectors, miners and ranchers of the Rocky Mountains and the Pacific slope, far from the restraints of society, has created a race which acts under very different impulses from those which kept the New England and Virginia colonists content with their narrow home between the Atlantic and the Alleghenies. And the self-assertive, though generous, spirit of the pioneer, who is untrammeled by precedent or prejudice, has communicated itself to the mercantile and technical classes of the West, and thus has helped, not a little, in fostering its extraordinary rapid growth. These men of the West are the real *coureus de bois* of our day, and acts of Congress would be as powerless to restrain them as were the *edits et ordonnances* of the French governors to check the roving habits of their predecessors. Wherever there is a new country to explore, if it contains minerals, these are the men to explore it. Let there be a great gold discovery in arctic or tropic regions, in the Klondike, or in central Africa, or New Guinea, and a contingent will start from the Rockies by the earliest train to catch the first steamer, with no baggage but its blankets—and the expedition will reach its goal, wherever that may be.*

Geology of California Petroleum.

A Survey of the State, by Counties, as to Origin of Oil-Bearing Formations.

By W. L. Watts.

The geological formations yielding petroleum in California range from the lower cretaceous to the quarternary; and in different localities the geological horizon of the productive strata differs in point of vertical range. In the Puente hills and at Los Angeles, the oil-yielding rocks are of the Neocene age. These formations were first classed as Pliocene, on account of the numerous Pliocene fossils found in them.

On the south side of the valley of the Santa Clara river in Ventura and Los Angeles counties, the principal oil-yielding formations probably range from the Neocene to the Miocene. On the north side of the valley of Santa Clara river in Ventura county there is evidence of petroleum in rocks ranging from the upper Neocene to the lower Eocene formations; the productive formation ranging from the Miocene to the uppermost portion of the Eocene.

In the foothills west of Bakersfield in Kern county, petroleum is found in formations ranging from the Eocene to the Neocene, and heretofore classed as Pliocene; but the oil-yielding formations, which have been tested by drilling, are supposed to be of the Miocene age.

Natural gas and oil have been obtained in the foothills of the Sierras east of Bakersfield, the formation being either of Pliocene or of Neocene age.

In Fresno county and Kings county there are exudations of petroleum from rocks of Miocene age; but the petroleum-yielding formations near Coalinga in Fresno county, which have recently proved very remunerative, appear to be of Eocene age, formerly called Cretaceous.

The geological horizon of the oil-yielding rocks of Moody Gulch, Santa Clara county, has never been determined.

Some oil has been obtained in the Tunitas and the Purissima Creeks in San Mateo county, from wells penetrating strata which are probably of Eocene age.

North of San Francisco, petroleum-yielding formations crop out along the coast at Bolinas bay and at Point Arena: at these places the exposed rocks are either of Pliocene or of Neocene age In Humboldt county several wells have been drilled, from which some oil has been obtained, the rocks penetrated being either of the Pliocene or of the Neocene age. On Bear Creek in Colusa county, gas and oil are found in rock of Cretaceous age. It is reported that in some places petroleum is found permeating eruptive or other crystalline rocks

At Stockton, in San Joaquin county, natural gas is obtained in remunerative quantities from wells permeating strata of quarternary age.

At Marysville Buttes, in the Sacramento Valley, natural gas is found in rocks of Eocene age. There are several places in Sacramento and San Joaquin valleys where wells are yielding sufficient natural gas to be of local value

The relative position in point of vertical range of the formations wherein remunerative oil wells have been obtained, in Ventura and Los Angeles counties, is demonstrated by an investigation of the country between the Piru and Sespe creeks in Ventura county, where the following sequence of formation can be seen. At the Piru creek, a conglomerate formation is seen containing Neocene fossils, Pliocene forms being most numerous. In some places the conglomerate is impregnated with petroleum; it rests on a shale formation, containing Neocene fossils. The lower portion of the shale is interstratified with sandstone, which in many places is impregnated with petroleum, forming an oil sand, the outcropping strata of which resemble the oil sands seen in the Puente hills in Los Angeles county. The shale rests on a whitish sandstone of Miocene age. This whitish sandstone contains remunerative oil-yielding strata.

The conglomerate, the shale, and the whitish sandstone in Ventura county constitute a group corresponding to a group of certain conglomerates, shales, and sandstones which probably form a large portion of the rocks in the oil districts of Los Angeles county; as in both of these counties these formations are of similar character and contain fossils of similar age. The principal oil-yielding formation found in the Puente hills in Los Angeles county and in the city of Los Angeles are certain oil sands which interstratify the lower portion of the shale formation, and probably constitute the uppermost strata of the underlying sandstones.

The whitish sandstone formation extends westward from the Piru creek in Ventura county, to the Sespe oil district also in Ventura county, the distance between the two places being about eight miles.

At the Sespe district the whitish sandstone rests on a shale formation, whitish and grayish at the top but passing into a dark-colored shale, which is interbedded with numerous thin strata, or nodular masses of hard bituminous limestone. These shales contain Miocene and Eocene fossils, and rest on a drab-colored sandstone of no great thickness. The drab-colored sandstone rests on a brown sandstone, locally known as the Sespe brownstone. This brownstone rests on white sandstone and the latter on buff-colored sandstone. The Sespe brownstone, the white sandstone, and the buff-colored sandstone all contain typical Eocene fossils. All these sandstones are more or less interbedded with shale. The principal oil-yielding formations in the Sespe district are the lowermost portion of the dark-colored shales, the drab-colored sandstone and the uppermost portion of the Sespe brownstone.

There are numerous seepages of petroleum in hard, buff-colored Eocene sandstone, but no remunerative oil wells have as yet been obtained by drilling in these rocks.

It is generally believed that in California the Miocene formations rest nonconformably on the Eocene. Observations in Los Angeles and Orange counties lead to the conclusion that the Neocene shales overlap the whitish sandstones; and there are some reasons for believing that the conglomerate rests nonconformably on the Neocene shales.

Since the Neocene period there have been not only epochs of unusual geologic disturbances, but also disturbance of a chronic nature, which have been contemporaneous with the disposition of the tertiary and quarternary formations. Similar disturbances continue to this day. It appears that in many instances these disturbances were of a local character.

The formations penetrated by remunerative oil wells in such portions of Los Angeles, Orange, and Ventura counties as have been examined by the writer are as follows:

In the territory extending between the Santa Ana river in Orange county and the ocean at Santa Monica in Los Angeles county, remunerative oil sands have been found in the lower portion of the Neocene and probably in the upper portion of the Miocene sandstone. In one instance oil was found in the overlying conglomerate.

At the Modello oil wells near Piru in Ventura

*Extracts from address to the American Institute of Mining Engineers.

county, remunerative oil sands have been found in the whitish sandstones of Miocene age.

In the Sespe district remunerative oil sands have been found in the upper portion of the Eocene sandstones and shales, which appear to occupy a position between the Miocene and Eocene formations.

It is probable that these oil-yielding localities have their counterpart in many other places in California besides those which have been mentioned, for the geological formations constituting these oil measures extend along the coast range from San Diego county to Humboldt county.

We have not yet obtained sufficient geological evidence to warrant the expression of anything more than tentative opinion concerning the actual geological horizon of the petroleum formations in the following oil fields: Those on the south side of the Santa Clara river, those north of Santa Paula in Ventura county, and those of Santa Barbara, Kern, Santa Clara, and San Mateo counties. But the data already accumulated warrant the assertion that the oil measures in the localities referred to are of tertiary age.

Fires in Mines.

The Calumet and Hecla Fire—An Ever-Present Danger—Mines that Have Been on Fire for Years.

In the afternoon of May 27, a fire was discovered in the Calumet and Hecla mine at the bottom of No. 2 shaft, 5,000 feet below the surface. Bitter experience has made the Calumet and Hecla management exceedingly fearful of fire, and every possible precaution has been adopted, not only to prevent the occurrence of fires, but also and especially to stay their progress, and to confine them within controllable limits. In the present case the fire broke out in the most important of the three distinct mines of which the great property is composed—that is, in the Calumet and Hecla mine proper. This has the largest number of shafts and openings and the greatest productive capacity, and if the fire should get beyond control, the damage would be incalculable. The Red Jacket shaft and the South Hecla mines, as well as the fourth mine now being opened on the Osceola amygdaloid vein, are thought to be beyond the danger zone.

At this writing it looks as if the company would get off with comparatively slight loss. It was at first thought that it would be necessary to build a big lime-kiln and flood the mine with carbonic acid gas, but it is now hoped that the fire can be made to exhaust itself without going to this expense. Gas is still escaping from the shaft, and no one can be sure that the danger of serious trouble is yet over, but everything looks favorable, according to official advices, and it is hoped to uncover the shafts within a few days and resume normal operations.

Although there is plenty of water in mines, as everyone knows, there is also an abundance of material out of which roaring conflagrations can arise. Inflammable gases, of course, are a constant and potent source of danger, and in some mines the artificial timbering alone would support a fire for months or even years. The Calumet and Hecla mine, for example, it said to contain one thousand million cubic feet of timbering. All mining experts know how hard it is to stop a fire that has once begun to eat its way through coal seams or other mineral deposits. In several well-known cases, fires are burning in mines today that originally started years ago. One mine in Butte, for example, has been on fire for sixteen years. The Vulcan mine near Newcastle, Colo., has been burning since the great explosion several years ago, when eighty lives were lost. In Pennsylvania a number of mines have been on fire a long time, and seem likely to burn for years to come. Although mining engineers have devised improved methods of fighting underground fires, the geologic conditions in some places are such as to render mines practically inseparable from fires and explosions. More than one mine has been wisely abandoned by its owner on this account.

A Suit for Rich Nome Claims.

Advices were received at Victoria, B. C., on June 8, from Cape Nome, that John Waterman will bring suit on partnership grounds against K. O. Lindbloom, the discoverer of Nome, for a half interest in fifty claims, including the richest at Nome. The suit involves millions. It will be tried at San Francisco.

Mining in South Africa.

A System of Legalized Robbery—Scandalous Royal Concessions—Five Per Cent Regularly Stolen—Princely Salaries Neutralized by High Cost of Living.

The cost of the war in South Africa has been enormous, and the mines of the region will doubtless have to bear the brunt of the burden thus imposed on the British government. For this reason some people are disposed to take a gloomy view of the immediate outlook for the mine-owners. It should be remembered, however, that there are offsetting items in the account of a most important and favorable nature. A very heavy annual tax by the new authorities, which would be certain and direct at all events, might easily be far less troublesome than the mass of taxation, direct, indirect, open, and thinly disguised, hitherto imposed by the Boers. Wm. Dinwiddie, now in South Africa for Harper's Weekly, draws up a formidable indictment against the Transvaal government in this respect.

President Kruger and his followers, he says, have established a system of government concessions which surpass, if possible, anything in Spain's colonial possessions as gigantic opportunities for official steals and rake-offs. These are farmed out to individuals, under the specious plea of promoting the industries of the country. One man has an exclusive government concession for the manufacture of sweets and candies, another controls the candle-market, and so on, through all the small trades. Why, a trust or a combine would blush at the profits these men rake in by means of their absolute power to control the selling price of certain commodities!

The railroad is a royal concession, which pays dividends, it is said, of something like two hundred per cent each year. The selling of dynamite is another, and this concession and that of the railroad have been extremely oppressive to the mine-owner. Dynamite, which can be delivered at the mines for thirty-nine cents for fifty pounds, costs the mine-owner eighty-five cents. The granting of these concessions was practically in the hands of President Kruger, and it has been carried to such length now that it is an open, festering sore in the Transvaal, where glaring scandal after scandal has been exposed.

Another evil has been the "tout labor system." No mine-owner to-day can secure labor without first ostensibly dealing with a chief of a black tribe, who agrees to furnish so many laborers for the mines at a bonus of from $60 to $80 per head, the rate of wage contracted for being seventy-five cents a day, or three or four times as much as that paid by the Boers anywhere in the veldt. The money is not paid to the black chief, however, but to a Boer go-between, and no questions are asked.

Again, the selling of liquor to the natives has been a constant and serious drawback to every Uitlander who employs laborers. It is against the law to sell liquor to natives, and yet every mine-owner estimates that twenty per cent of his high-paid black laborers are totally incapacitated for work during two days of the week by drunkenness. Appeals to Pretoria have been in vain, and as the Secret Service men are the principal agents of the concessioner of liquor, it follows that no arrests are made for illicit selling of intoxicants.

Once more, these mine-owners estimate that five per cent of their total output of gold is stolen, in the shape of amalgam and refined gold. It has been practically impossible to secure conviction of thieves, even when taken red-handed in robbery, because, as much evidence goes to prove, the Secret Service Department of the government, on which millions have been expended annually during the last few years, is the active agent to whom the gold is sold, while high officials are the principal bankers of the ill-gotten, but well-protected, gains.

It is no wonder that the mine-owner kicks against these outrages, growing heavier every year. He pays heavy land taxes, taxes on improvements, income taxes, taxes on output, and poll taxes. He pays perfectly frightful prices for everything he wears and eats. His railroad expenses, for freight and personal travel, are the highest in the world. The decoration and furniture of his house are secured at abnormal prices. In fact, to exist and continue these profitable mining industries, he has silently permitted himself to be robbed, right and left, for years, knowing that he was furnishing practically the entire revenue of the country, and building up the fortune of every burgher who came inside the charmed official circle—the golden ring of Kruger. Yet, with all this, he was denied the right of any representation or voice in the government. If he had had a say in the administration, it would have meant the death-blow to many corrupt practices. The old President knows this, and is struggling now, in a last grand fight, to keep England out, the Uitlanders in his control, and the wizard's hen that lays the golden eggs in his clutches.

The Boer farmer contributes hardly a thing to the treasury of his government; the laws have all been framed so that he shall never bear the burdens of taxation, and thereby become disgruntled with the nation's guiding hand. He may even (if hard up) borrow money form the government on his landed estate (which consists, usually, of from 10,000 to 16,000 acres of unfertile, arid land, over which a few cattle graze, and a home-place of mud, with half an acre of slightly cultivated garden-patch), if he states that he needs it for improvements. With his slovenly habits of mind and body, it is no wonder that he is content with this government and believes implicity all that Oom Paul tells him.

Not a cent of money could be raised by the municipal authorities of Johannesburg, for public purposes, without the consent of the government at Pretoria; not a city ordinance or local law could be passed without authorization from this same power. In other words, Johannesburg, the centre of wealth, of culture, of population, the headquarters of the Uitlander in the Transvaal, was absolutely as much under the thumb of President Kruger and his followers as is the infant in the arms of its mother. The Uitlander is not the kind of offspring to take kindly to too much wet-nursing, nor to care for a mother with pins in her clothes.

The development of the mining industry of the Transvaal has been a marvellous growth, and the figures used in expressing the money invested stagger the mind. It costs from two to eight millions of dollars to put down the preliminary shaft of several thousand feet to the gold-bearing reef and to erect the machinery. Many of the mines have eaten up twenty millions before they have returned a cent of profit. The net returns, however, on this immense capitalization are from ten to twenty per cent, some having reached still higher figures. When they, the mine-owners, talk of monthly outputs of 490,000 ounces of gold —$9,000,000 and over—the poor man with a little change in his pocket sadly jingles it together and wishes he were rich. In these mines the average pay for a white man is $5 a day; chemists, engineers, and other professional men receive salaries all the way from $10,000 to $60,000 per annum; but they all agree that the cost of living is triple that of the high-priced mining-regions of the United States. It would certainly seem that such a stupendous enterprise, which employs a hundred thousand natives, and has over fifty thousand wide-awake white men engaged in it, deserves to survive and flourish in this far-away land, under a decent system of government, and with some of the privileges we enjoy in our own land, particularly when we remember that a large proportion of these men are our cleverest and ablest professional men—Americans who believe in American ideals.

A Desert Smelter.

For some time past it has been known that a smelter was to be built at the Needles in San Bernardino county, California, contracts for ore having been made between quite a number of miners in adjacent camps and the smelter people.

The buildings have been completed and the foundation for the machinery is in place, though not yet sufficiently hard to be used. The machinery will soon be on the ground, and when the plant is in operation all doubt will be settled as to whether a smelter can be economically operated at such a point as the Needles. The smelter will not be in operation before August or September.

Rumored Smelting Consolidation.

Statements have been going the rounds of the press that the American Smelting & Refining Co. has absorbed the extensive smelting plants of M. Guggenheim's Sons. Such a consolidation would mean a virtual monopoly of the smelting business of the country for the treatment of gold, silver, copper and de-silverized lead. The details of the arrangement have been published with sufficient particularity to argue at least some foundation in fact, but we are assured on high authority that the rumors are altogether baseless.

Liquid Fuel for Motive Power.

The scarcity and high price of coal in Europe have given much impetus to the construction of apparatus for using liquid fuel, petroleum, benzine, and gasoline, and competent authorities are sanguine of success in this innovation, according to Consul-General R. Guenther at Frankfort. The advantages of liquid fuel, when properly applied, are obvious. There is no smoke, no stoking, no ashes or cinders, no incomplete combustion, the fire can be started or shut off at a moment's notice; a more even temperature can be maintained than by the use of coal or wood, and the fire can be regulated by the mere turning of a single cock. There is no dust or dirt, no spacious coal sheds are required, and there is no danger of spontaneous combustion, as frequently happens with coal.

It is claimed that petroleum and its manufactures will soon to a great extent supersede the use of coal for manufacturing purposes, and therefore the supply of petroleum becomes of great importance. Statistics show that the United States and Russia are between them producing, in round numbers, 120,000,000 barrels a year, and that the production of outside countries has of late increased so much that they are able to contribute enough now to bring the world's aggregate annual production to about 150,000,000 barrels. It is well known that the production of Russia is much less now than it might be, owing to the lack of enterprise of the people and to inadequate transportation facilities, which cause the price to be higher even in Germany, adjoining Russia, than that of American petroleum, which has to travel thousands of miles.

What is true of Russia is even more true of Asiatic countries, like Persia. The increased demand will stimulate the exploitation of oil fields in the different lands. Railway companies are trying oil-fired locomotives; one steamship line has adopted oil for firing under the boilers of most of its vessels. When oil was first burned under the boilers it was introduced through an open trough or gutter, or placed in the furnace in bowls. A new system is now employed, and is gaining in favor, whereby the oil is evaporated by being mixed with hot air. This is said to be an improvement on the method of employing a steam jet. Nothing seems to be in the way of a more extensive use of oil for fuel, except the price.

Benzine and gasoline are used to furnish motive power for many different purposes, and their use is constantly increasing. A benzine-worked locomotive, constructed at the Deutz Gasmotor Works, near Cologne, has been running in the third level of the Laurahutte colliery, in the Kattowitz coal district, for over a year. With the exception of a slight derangement, which was readily repaired, the locomotive has performed its work satisfactorily and without interruption. The locomotive weighs 4,600 pounds; the length is nine feet two inches; width, two feet eleven inches; height from rail to level, one foot four inches; and gauge, one foot eight inches. It has 6 HP. The actual work performed by the locomotive is the hauling in one trip of from thirteen to fourteen buckets loaded with ore, weighing about 1,375 pounds, or about 120 metric tons a shift. To do this, the consumption of benzine is about twenty-two pounds, and the daily expenses, including interest on investment and sinking fund, wages of engine driver, benzine, and lubricants, are $1.80; so that the cost of hauling one metric ton (2,200 pounds) is one and a half cents, against two and five-sixth cents with horses. As the engine is closed on all sides, so that the driver can only get at the interior by using a key, the danger of explosion is practically obviated. No inconvenience from the odor emitted has been experienced by the miners working in the level.

What is Russia Doing with Siberia?

The Russian Imperial government seems in regard to the Siberian gold mining industry to be very markedly halting between two opinions, observes a contributor to the Mining Journal, of London. On the one hand the economical position of the Empire, and the declared policy of the Finance Minister, seem to indicate their desire to throw open the gold mines to all bona fide industrialists desirous of working them; on the other hand, their jealousy of the foreigner is such, and their love of bureaucratic methods so confirmed, that they find it very difficult to refrain from putting all sorts of stumbling blocks in the way of regulations in the path of those who have it in mind to migrate into the Siberian gold districts. The result of this curious and contradictory attitude of mind has been to awaken quite a false impression in the minds of many miners anxious to break new industrial ground. Deceived for it is nothing less—by the publication of elaborate official reports as to gold deposits, and the implications contained therein that all genuine workers will be welcomed in Siberia, a sort of trek has been organized in America, and the Russian Consul at San Francisco has been besieged with inquiries as to prospects and localities. Strong in the customary dread of his own government, the Consul has professed entire ignorance of the question and has referred the inquirers to the Russian Embassy in New York, where a similarly unsatisfactory state of mind was found to exist. After sifting the whole question the applicants were brought face to face with the fact that the only possible procedure was to memorialize the Russian Czar for permission to prospect in the desired territories, when an inquiry would be instituted into the whole matter. Rather barest acquaintance with Russian official ways shows that this would mean a delay of several years. In fact, the whole future of Siberian industry, which at one time looked promising enough, seems likely to be crushed by the heavy hand of Russian bureaucracy, and gold mining will probably meander on in the old way oppressed by a vast code of inconvenient official regulations. No one doubts that Siberia is rich in gold. The statistics as to output, won in the face of the mining code, are sufficient evidence as to the richness of the field; but it would seem to be impossible for industry to flourish when the whole weight of the government is directed to codify, rather than to assist, its growth. The Mining Journal earnestly advises any of its readers who may think of embarking in this hazardous sphere of enterprise to pause, and above all not to give absolute credence to the loose statements which are sometimes current as to the welcome which will be given to prospectors by the official representatives of the White Czar.

Selective Action of Cyanide Solutions.

In the Transactions of the Institute of Mines and Metallurgy for November 15, 1899, are some valuable notes by H. H. Greenway upon his experiments to determine the selective action of potassium cyanide solutions on copper, gold and silver ores. Mr. Greenway's experiments brought him to the interesting conclusion that a cyanide solution for dissolving gold and silver and not the base metals associated with them is a saturated and not a weak one. The result differs widely from previous ideas on the subject. Figures are presented showing the gradual increase in cyanide consumption on copper-bearing ores up to the point of saturation, when the amount consumed, according to Mr. Greenway, "was almost incapable of estimation." Mr. Greenway's discoveries are certain to be followed by further investigation on the subject.

In discussing Mr. Greenway's report, the Canadian Mining Review calls attention to the fact that a point of no little moment in cyanide work, which has not received the attention which it deserves, is the velocity of the percolating solutions. It is generally understood that the highest rate of solvency of gold and silver is accomplished when the speed of the solvent is just sufficient to remove the film of saturated solution around the precious metal particles as fast as it forms. This is true, but the superficial area of the particles has much to do with the matter, so that the same velocity will not apply in all cases. There is a maximum velocity of solvent at which a maximum rapidity of solution can be effected, which should be determined for each ore. And it should be borne in mind that this velocity is not the same for silver and gold. By leaching at the proper velocity for the gold, and subsequently at another velocity for the silver, very great improvement in total extraction can in many cases be obtained. The only exception apparently is where the gold and silver are alloyed, when the same velocity will give the maximum possible extraction with that ore.

A Self-Propelling Gold Dredge.

The accompanying illustration shows a self-propelling gold dredge used on the Yukon River and elsewhere for dredging the river bottoms for gold. The dredging is done by means of an adjustable elevator constructed of two chains and provided with buckets of suitable size and shape for digging. The elevator is pivoted at the delivery end so that it can be raised and lowered to suit the depth of the water. As the material is discharged from the buckets it falls onto a coarse screen or grizzly. The large stones and other worthless material pass over the grizzly and are discharged back into the water, while the finer and gold-bearing material passes through the screen onto gold saving tables or other appliances generally used for gold saving purposes.

A SELF PROPELLING DREDGE ON THE YUKON

The elevator is operated by means of a steam or gasoline engine. Suitable hoisting drums are also provided for raising and lowering the elevator and shifting the boat. The boat is propelled by means of a stern wheel driven with sprocket wheels and chain from the engine, which also furnishes power for the balance of the machine.

The engine and other parts of the equipment are built to suit the capacity and the depth of the water. The entire outfit of machinery for these boats, consisting of elevator, stern wheel drive, drums, engine and boiler, is furnished by the Jeffrey Mfg Co., Columbus, Ohio.

Ohio Mining Institute.

The programme for the summer meeting has been arranged. The members will leave Columbus on the morning of Tuesday, June 19, in a special car for Toledo, where they will spend the afternoon in witnessing the operation of a new car-unloader designed to handle cars of the largest capacity. They will then take the evening boat for Detroit, spending the following day in viewing the various points of interest in that charming city. On Thursday the party will take a trip across Lake St. Clair, with a fish and frog dinner incidentally. The meeting promises to be unusually pleasant and interesting.

Exhibits of Mining Machinery.

It may not be generally known that the Edw P. Allis Co. of Milwaukee maintains well-appointed mining machinery departments in connection with its New York and Chicago offices. The numerous class of people interested in one way or another with the products of the Allis Co. would find it most interesting and profitable to visit these offices—either the New York office at No. 95 Liberty street, or the Chicago office at 509 Home Insurance Building. Although many buyers prefer to transact their business close to headquarters, in the present case they could be served with equal satisfaction at the branches mentioned.

Latest Mining Decisions.

Specially prepared for THE MINING AND METALLURGICAL JOURNAL.

Where the lessee of an undivided interest in a mine sued the lessor's co-tenant for refusal to allow him to work the mine during the term of a lease which had expired, such action was not to recover for the loss of prospective profits, but for damages then accrued. Paul vs. Cragnaz, 60 Pac. Rep. (Nev.) 983.

In an action to quiet title to mineral land, where a conveyance from the original locators to defendant, under which he claimed, was shown to have been lost, and that he had never read it, it was not prejudicial error to allow him to testify as to when the instrument was made, and when he began work on the claim. Simmons vs. McCarthy, 60 Pac. Rep. (Cal.) 1037.

Where a witness on direct examination stated the boundaries of a mining claim, and the notice of location posted by him for the locator gave the same boundaries, it was not improper to require him to state on cross-examination whether the notice also contained a statement that the notice was made for the purpose of re-establishing the boundaries. Simmons vs. McCarthy, 60 Pac. (Cal.) 1037.

Under the rule that where a lode mining claim is located across, instead of along, the vein, the original side lines become end lines, and the end lines side lines, the owner is entitled to all the rights with reference to the new side lines that he would have had if they had originally been located as such, including the right to follow the dip of a vein having its apex within the surface boundaries of his claim beyond the vertical plane passing through such lines. Empire Milling & Mining Co. vs. Tombstone Mill & Mining Co., 100 Fed. Rep. (U. S.) 910.

Under Hill's Ann. Laws, § 3669, providing that material men shall have liens on any "structure" where a stamp mill and tramway is built from the mill to the mine, the mill, mine, and tramway do not constitute such an entire "structure," so as to invalidate a mechanic's lien filed for material used in erecting the mill and in constructing the tramway, because such lien was not filed against the mine also. Watson vs. Noonday Min. Co. et al., 60 Pac. Rep. (Ore.) 994.

Where defendant's right to a partition of a mining claim, which he owned as a co-tenant with plaintiff's lessor, was not involved in an action by plaintiff to recover damages for defendant's refusal to allow him to work the mine under a lease of an individed third interest of the owners, an objection that the lease was void because it would prejudice defendant's right to a partition will not be reviewed on appeal. Paul vs. Cragnaz, 60 Pac. Rep. (Nev.) 983.

Though a void tax deed of mineral land is admissible to show that the grantee entered under a writen instrument, in order to bring him within the provisions of Code Civ. Proc., § 323, declaring what constitutes adverse possession under a written instrument, it was harmless error to exclude it in an action brought by him to quiet title, where it was shown that he had not been in exclusive possession of the land during the requisite period. Simmons vs. McCarthy, 60 Pac. Rep. (Cal.) 1037.

In an action by a lessee of the owner of an undivided third of a mine to recover against the owner of the remaining interest for his refusal to allow him to work the mine, defendant's contention that plaintiff could not recover for loss of profits he might reasonably expect to have derived therefrom was without merit; it appearing that the mine had been worked previous and subsequent to the term of the lease at a profit, and had yielded a desirable product. Paul vs. Cragnaz, 60 Pac. Rep. (Cal.) 983.

Where plaintiff in an action to quiet title to mineral land claimed exclusive adverse possession from the date of his location, and the evidence showed that defendant had purchased an interest from prior locators, and had continued in possession with them until they leased it to a third party for a term of years, which expired after plaintiff's entry, the lease was competent evidence to show that defendant was in possession by his lessee when plaintiff was claiming exclusive possession. Simmons vs. McCarthy, 60 Pac. (Cal.) 1037.

A single contract made by a corporation owning mining ground in a territory, by which it employs and agrees to pay a second party to exploit and develop the property, does not constitute a carrying on of business in the territory by the corporation, within the meaning of the statute requiring foreign corporations carrying on business within the territory to file copies of their articles of incorporation, and providing that every act done by them prior to the filing thereof shall be void; and such statute does not affect the validity of the contract. Empire Milling & Mining Co. vs. Tombstone Mill & Mining Co., 100 Fed. Rep. (U. S.) 910

In an action by a lessee of the owner of an undivided third of a mine to recover damages from the owner of the remaining interest therein for his refusal to allow him to work the mine, the fact that all the evidence as to the amount of ore mined prior and subsequent to the term of plaintiff's lease was stricken out did not entitle defendant to a nonsuit, where it appeared that ore was mined by defendant during such term at a profit, and defendant failed to deny an allegation in the complaint that he had extracted ore of a certain value. Paul vs. Cragnaz, 60 Pac. Rep. (Nev.) 983.

Defendant, the owner of a mine, contracted with plaintiff, which owned an adjoining claim, to extend its workings into such claim, for a stipulated price, for the purpose of exploiting and developing the property, and agreed that, should any marketable ore be taken therefrom in the course of such development, it would sell the same, and account to plaintiff for the proceeds. Held, that defendant was not estopped by such contract from claiming the proceeds of ore so removed and sold as its own, where, in making the development, it discovered that the vein from which it took such ore had its apex within the lines of its own claim, and the ore was, therefore, its own property. Empire Milling & Mining Co vs. Tombstone Mill & Mining Co., 100 Fed. Rep. (U. S.) 910.

Hill's Ann. Laws, § 3678, provides that no payment made by the owner to any contractor before the expiration of 30 days from the completion of the structure shall be valid as against any mechanic's lien unless such payment has been distributed among those who labored on or furnished material to be used in such structure. A contractor constructed a stamp mill and tramway in connection with a mine for defendant, and the material men filed liens against the property. Held, that a judgment might be rendered against the owner in an action to foreclose the lien for an amount in excess of the contract price necessary to satisfy the material men's claims, though the complaint did not allege that the amount was due the contractor. Watson vs. Noonday Min. Co. et al., 60 Pac. Rep. (Ore.) 994.

Laws 1899, p. 134, authorizes a nonjoining cotenant of mining property to recover his share of the net profits of the mine, or his proportionate share of all ores on the dump, on payment or tender of the costs of mining the same in a miner-like manner. Held, that where defendant, a co-tenant, wrongfully worked a mine through a shaft from another mine, in which plaintiff had no interest and to which he had no right of access, plaintiff was entitled to an injunction pendente lite, restraining defendant from continuing to work such mine, though he failed to tender his proportionate share of the cost of mining the ore extracted therefrom, since such tender was excused by plaintiff's inability to ascertain what ores it was entitled to in order to estimate the amount of such tender. Butte & B. Consol. Min. Co. vs. Montana Ore Purchasing Co. et al., 60 Pac. Rep. (Mont.) 1039.

Code Civ. Proc. 1895, § 592, authorizes a tenant in common to sue for an injury to the property by a co-tenant; and Laws 1899, p. 134, amending the same, declares that nothing therein shall prevent the occupancy and enjoyment of mining property by co-tenants, or the operation of the same, subject to accounting to a nonjoining co-tenant for net profits, nor prevent such joint co-tenant from receiving his proportionate share of all ores on the dump, on payment or tender of the cost of mining the same. Held, that a co-tenant not joining in the operation of a mine, and suing for damages for the removal of ore therefrom through another mine, owned by his tenant in common, to which plaintiff had no right of access, was entitled to an injunction pendente lite to restrain such removal, though defendant offered to account for ore extracted therefrom. Butte & B. Consol. Min. Co. vs. Montana Ore Purchasing Co. et al., 60 Pac. Rep. (Mont.) 1039.

Hill's Ann. Laws, § 3669, provides that material men shall have liens for materials furnished for improvements on land, and that every contractor having charge of the construction of any building or improvement for another, shall be held to be the agent of the owner. A contractor constructed a stamp mill and tramway in connection with a mine for defendant, and the material men filed liens against the property. In an action to enforce the liens, judgment was given against defendant for the amount, directing that the mill and tramway be sold to satisfy the judgment and that any surplus of the proceeds should be paid defendant, with no provision for an execution against other property in case of a deficiency. Held, that as the defendant was a party to the contract, plaintiff could have a personal judgment for the deficiency, notwithstanding the recitals in the judgment of the amounts found to be due. Watson vs. Noonday Min. Co. et al., 60 Pac. Rep. (Ore.) 994

An Atlantic Shipping Port.

Greenville, Hudson County, N. J., may become one of the greatest coal shipping points on the Atlantic coast. It is said it is the intention of the Pennsylvania Railroad to make several improvements at that place, consisting of a new bulkhead as well as piers extending far out into the river. These piers are to be used not only for the loading of freight on the vessels, but for putting cars on floats and for the loading of soft and hard coal into vessels.

COPPER NOTES

COPPER RANGE: Although the stock of this company recently sold in Boston at the lowest level yet reached (17), President Paine declares that the company is doing well. He says that the road is paying its operating expenses, and that the mine is promising. Four three-compartment shafts are being sunk at the rate of fifty feet a month, and other development work is going on rapidly.

MORE JERSEY COPPER: A discovery of copper at Arlington, N. J., aroused much interest a few weeks ago, and now M. B. Wallace of East Orange, N. J., thinks he has found a similar bonanza at the bottom of a well. The well had gone dry and in deepening it, ten feet of solid rock had to be penetrated. Noticing greenish spots in some of the debris, Mr. Wallace had the rock assayed and found that it contained 5.50 per cent of silver and ten per cent of copper.

BOSTON & MONTANA: M. Donohue, general manager of the Daly interests in Montana, and Mr. Daly's right-hand man since the organization of the Amalgamated Co., has resigned. The bulk of his duties will be assumed by Frank Klepetko, the Boston & Montana general manager.

The Supreme Court has issued the injunction asked for by the Boston & Montana against the Montana Ore Purchasing Co., restraining the latter from working in the disputed territory. Mr Heinze, however, put 200 men to work there on June 4, basing his right to do so on the verdict he had received in the District Court.

TRADE NEWS.

A. G. Godfrey recently shipped to Mexico some of his well-known Malt dry gold savers.

The Baker Iron Works of Los Angeles is profiting largely from the activity of the oil districts in Southern California. Much of the machinery needed by the new plants has been supplied by this old and reliable concern.

F. W. Braun & Co. of Los Angeles are sending out to their customers a handsome private mailing card embossed in bronze zinc, illustrating some of the assaying specialties handled by this house.

Thomson & Hoyle may be safely regarded as one of the leading pipe manufacturing concerns of the entire southwest. Their order file is unusually congested at this time with demands for steel, mixing pipe, cyanide tanks, air pipe and hydraulic machinery.

The Pacific Tank Co. of Los Angeles and San Francisco are unusually busy at their San Pedro works on account of the petroleum developments in southern California. A wide variety of leaching, solution, syrup, and water tanks and extraction boxes, constitute the output of this company.

The Taylor Iron & Steel Co., High Bridge, N. J., is filling a large contract for steel wheels to be used on the sugar plantations in the Sandwich Islands. They will be shipped around Cape Horn to San Francisco and consigned to the Hawaiian Commercial and Sugar Company, Kahului, Hawaii.

Russell & Kinsey, manufacturers of the Little Alaska Gold Washer, follow up placer discoveries with keen interest, and many of their washers will render excellent service at Cape Nome this summer. The machine weighs 7½ pounds, takes up

little room, requires very little water, saves all the gold, and will wash five tons a day

The D. Van Nostrand Co. have just brought out a large and skilfully arranged catalogue of its numerous technical books on chemistry, physics and chemical technology. The catalogue is alphabetized, classified by subjects and by authors, and is easy to use and understand. The book will be sent without charge on application to the D. Van Nostrand Co., No. 23 Murray St., New York City.

Queen & Co., the famous manufacturers of engineering and scientific instruments, make a specialty of repair work. Drawing and other instruments are frequently discarded because of some slight imperfection when they might be made virtually as good as new by a little repairing or by one or two replacements. Engineers and others who use these instruments should write to Queen & Co., 1010 Chestnut St., Philadelphia, before throwing away as worthless an instrument that might easily be made almost new at slight expense.

Architects, consulting engineers, owners and persons interested in the subject of protective paint for steel structures, will receive a handsome card illustrating several eighteen-story steel structures upon which Dixon's Silica-Graphite Paint has been used, if they will send their address to the Joseph Dixon Crucible Co., Jersey City, N. J. The card also contains suggestions for specification of the paint, and its well-known durability has led to its specification and use upon many immense steel viaducts, bridges, and manufacturing plants all over the world.

An attractive catalogue has just been issued by the M. C. Bullock Mfg. Co. of Chicago, describing the "Bravo" Hand-Power Diamond Drill. The first page of the catalogue bears an excellent likeness of the late Milan C. Bullock, the distinguished founder of this house. The catalogue is a little book of only sixteen pages, but it contains a mass of information on the general subject of drilling, and especially on the operations of the "Bravo" drill, which will make it of considerable value in mining circles. It is well illustrated with diagrams and cuts. One page is devoted to flattering testimonials from users of Bullock drills.

Construction and Development News.

The Carson Lime Co. of Riverton, Va., will soon purchase a rock drill.

The Greer Machinery Co., Knoxville, Tenn., wants a second-hand 10 to 12-HP. hoisting engine.

The Hockessin Kaolin Co. has been formed to develop kaolin and fire clay beds near Hockessin, Del.

The Carver Coal Co., Plymouth, W. Va., wants prices and catalogues for electrical mining machinery.

The Petersburg Iron Work Co. of Petersburg, Va., wants a second-hand 10-HP. portable engine and boiler.

A large coal washer is to be erected by the Republic Iron & Steel Co. at its Sayerton mine near Birmingham, Ala.

R. E. Green, Middleport, O., is about to purchase a double cylinder 30-HP. mine hoist, also a single cylinder, 10-HP. hoist with drum.

A new plant for the manufacture of boilers, radiators and registers will be operated by the Converse Mfg. Co. at Benton Harbor, Mich.

The Crudup ore properties in Crudup, Ala., have been bought by W. F. Stowers of Attalla, Ala., for $9,000. New machinery will be installed.

The Des Moines Coal & Mining Co. of Des Moines, Iowa, will open a big mine and mill north of its present mine at Marquisville.

Wright & Co. of Cripple Creek, Colo., are developing the Rara Avis, and will soon install a hoisting plant for the main shaft.

J. W. Holman of Central City, Colo., is manager of the Good Luck mine in Gilpin county, whose shaft will soon be sunk to a considerable depth.

The plant of the Southern Klondike Mining Co. in Carroll county, Ga., will soon be doubled in size. W. D. Owen of Jacksonville, Fla., is president.

The Davis Coal & Coke Co. will soon purchase hoisting apparatus for its shaft at Henry, W. Va. The company should be addressed at Thomas, W. Va.

About 7,00 acres of coal lands near Charleston, W. Va., have been secured and will be opened at once by the Marmet-Smith Co. of Charleston.

D. N. Heizer of Colorado Springs, Colo., has organized the Spearfish Gold Mining Co. and purchased 365 acres of mining ground in the Ragged Top district, Lawrence county, S. D.

Charles S. Adams, with offices in Jacksonville, Fla., is secretary of the Southern Phosphate Mining Co. which expects to develop properties at Early Bird, and mine about 15,000 tons this year

A. H. Tarbet of Salt Lake City, representing Salt Lake and eastern parties has bonded the Buffalo group of mines, twenty-three miles north of Elko, Nev., in the Marriam district.

W. S. Elder and R. F. Jamison of Deadwood, S. D., are interested in a deal for the erection of a cyanide plant on the American Express property in Sheeptail Gulch, Lawrence county, S. D.

The Denison Land & Zinc Mining Co., recently incorporated at Harrison, Ark., will work 120 acres of lead and zinc lands near that place. E. H Lingo of Denison, Tex., is president of the company.

The National Charcoal, Iron & Steel Co., recently incorporated at Dover, Del., will erect a plant costing $400,000. Twenty tons of charcoal product and eighty tons of steel will be produced daily

Extensive operations are being undertaken by the Georgia & Alabama Coal & Iron Co. of Cedartown, Ga. New mines will be opened which will increase the company's output of ore to about 1,000 tons a day.

P. E. Hall and F. H. Safford of Helena, Mont., have taken a two years' lease and bond of the Iron Mask mine in Broadway county, Mont., from J. E. Krouse. The shaft is to be pumped out and sunk to the 600-foot level.

The Shasta Electric Light & Power Co. has been incorporated at Shasta, Cal., for the purpose of erecting an electric power plant on the McCloud River above Baird. George A. Knight, C. E. Green and C. A. Warren are among the incorporators.

A fire destroyed most of the machinery at the Persia mine, seven miles from Mariposa in Mariposa county, Cal., recently. A ten-stamp mill, the hoisting works and the shop equipment and rock crusher were practically destroyed. All will be replaced.

Manager Duvall of the Boston Gold-Copper Smelting Co. of Leadville, Colo., is planning to increase greatly the capacity of the company's pyritic smelter. Two furnaces will be erected, giving the company a capacity of 1,000 tons a day, an increase of 700 tons.

Extensive improvements will be made in the plant of the Republic Iron & Steel Co. at Hazelton, near Youngstown, O. A new 400-ton blast furnace will be erected, the old furnace will be remodeled and five new blowing engines will be installed.

PERSONAL.

F. W. Denton assumed his duties as assistant superintendent of the Atlantic Mining Co. on June 1.

G. B. Crowley and A. Shallenberger, mining prospectors of Los Angeles, have gone to Mineral Park, Ariz., to undertake the opening up of an abandoned mine.

David J. Williams, for seventeen years with the Cambria Steel Co. of Johnstown, Pa., is now superintendent of the American Tin Plate Company's plant at Cumberland, Md.

Albert Ladd Colby, metallurgical engineer of the Bethlehem Steel Co., is now in Europe as the representative of the Association of American Steel Manufacturers at the Paris Exposition. He will read a paper before the Paris Mining Congress.

Austin C. Brown, at one time with the Montana Ore Purchasing Co. as metallurgist, is now in charge of the Bully Hill copper plant in Shasta county, Cal., one of Captain De La Mar's properties.

W. B. Begeer, well-known throughout the mining world as first assayer of the Government Mint at Pretoria, South Africa, for a number of years, has come to this country and will identify himself with Colorado mining interests as an expert in the cyanide process. He is the author of the well-known book, "Metallurgy of Gold on the Rand."

AMONG THE ENGINEERS.

John A. Church of 11 William St., New York City, has gone to California for a two months' trip.

Luckraft & Countryman of Cripple Creek, Colo., have established a branch office at Grand Encampment, Wyo.

Theo F. Van Wagenen of Denver, Colo., the well-known engineer and writer on mining topics, recently visited Los Angeles

Lew E. Aubury, the well-known assayer of Los Angeles, is interested in some mines in Mariposa county, and has been spending a few weeks in that region.

Forbes Rickard of Central City, Colo., is leading a party of prospectors on a trip along the eastern Siberia coast to examine gold-bearing sands. On the way to Siberia the party will visit Cape Nome

George H. Evans of Denver has been in Boston on a business trip. He has charge of large hydraulic mining enterprises in Summit county, Colo., which will be operated by dredges and by a hydraulic elevator, invented by him

Walter Harvey Weed of the United States Geological Survey has just returned to Washington from a trip to Butte, Mont., where he has been studying the underground workings of the mines in that camp. He has in preparation a monograph upon the ore deposits of Butte

CORRESPONDENCE

CALIFORNIA.

(From Our Special Correspondent.)

Randsburg, Cal., June 4, 1900.

Probably no other mining section of California has made such progress in developing its properties as the Rand district of Kern County. The valuable mines of the region were discovered in 1895, through the energy and ambition of a few hardy prospectors who had to pack (a western word meaning to carry) water, food, clothing, and mining implements, either on their own individual backs or on those of mules, many miles over hot and waterless deserts. Their industry and persistence were well rewarded, as the mines promise to be as permanently productive as the famous South African gold placers or the Cripple Creek mines. Six years ago, the section was a vast wilderness, uninhabited except by coyotes and rattlesnakes, who enjoyed a temperature of 125 degrees in the shade during the summer months. To-day, by a magical transformation, two lively mining settlements with a probable population of 5,000—Randsburg and Johannesburg—with railroad connections and other appropriate appurtenances of civilization occupy the site. The country around these energetic towns is of a rolling nature, the towns themselves lying at an elevation of about 3,500 feet.

Public schools, churches, a newspaper and banks, serve the varied wants of the population. Since the development of the mines, the whole country for miles around has felt the stimulus of the new force.

At first the mines were worked by the dry-washing process, and even to-day some claims can be seen still so worked. As development progressed and richer lodes were unearthed, modern appliances were introduced and scientific, systematic methods brought their inevitable larger returns. Many claims have proved to be valuable, and have paid profitable dividends to discoverer and owner. The chief of these is the Yellow Aster, which has had erected on its ground a 30-stamp mill, and has paid since the first of the year $80,000 in dividends. Its aggregate dividends to date exceed $400,000. This mine has an immense body of ore in sight that will probably insure its prosperity for many years to come.

Several other mines make a similarly, if not equally, good showing considering the amount of work done on them and amount of capital invested. Among these may be cited the Butte, Kinyon, Wedge, Windy, Val Verde, etc. The aggregate output of all the claims of the Rand district up to date is probably not far from $5,000,000; and the chances distinctly favor an increased annual output from this time on.

In the next or an early number of the Journal, I hope to submit detailed reports of other mines here and on the line of the railway toward the Needles. These reports I shall make up with care from material that I mean to gather on the ground in the next few weeks.

MICHIGAN.

(From Our Special Correspondent.)

Houghton, Mich., June 7, 1900.

The chief topic of conversation here of late has been the Calumet and Hecla fire, which threatened at one time to become exceedingly serious and which may yet prove more damaging than seems probable at this time. The fire broke out on Sunday, after the fatal fashion of some earlier Calu-

met fires, May 27, in No. 2 shaft, nearly a mile below the surface. Only a few timbermen, watchmen, etc., were below at the time.

A party of twelve was organized at once to go down the shaft and close the trap doors. Deadly carbon monoxide drove the men away before all the doors could be closed, and it is possible that the flames will on this account find an avenue of escape to other shafts. The men were brought back to the surface almost in a dying condition. For years, the managers of this mine have studied currents and drafts, and have thought out elaborate methods of fighting fires, and unless they have grossly deceived themselves, it will be impossible for this or any other fire to do irreparable damage. It is thought that the fire can be kept where it is in shaft No. 2, and that even there its course can be strictly regulated and brought to a comparatively early close.

This is the third great fire that the Calumet and Hecla mine has suffered.

On November 22, 1887, a fire started which burned steadily for five months. Only a few months later, in August, 1888, another fire occurred, and in January, 1889, after it was supposed to have been quite extinguished, it broke out anew and burned four months. Since then no serious conflagration has occurred, but the present trouble will remind stockholders that what they own is after all only a mine, subject to the well-known hazards of mining property in general. The first fruit of the fire from the stockholders' standpoint may be found in the cut in the dividend from $20 to $10, declared May 29. It is hoped now that the revenues of the company will not be seriously impaired by the present fire, and that the dividend record for the year will ultimately be made as good as that of any previous year. The decision of the directors, however, to cut the current dividend is commended here as conservative and prudent under the existing circumstances.

The output of the Quincy mine for May was 737 tons. This is the lowest May output in five years, comparing with 850 tons, for example, as far back as 1896. The Quincy output for the first five months of the year is 3,798 tons, which is likewise the lowest output for this period in the last five years. The production in 1899 for the five months was 3,931 tons.

The new pump at Isle Royale will have a daily capacity of 15,000,000 gallons and will be a duplicate of the Arcadian pump.

The Calument and Hecla is grading for a new warehouse, 80 by 250 feet, opposite the supply-house. Railroad tracks will run through the structure.

MISSOURI.

(From Our Special Correspondent.)

Joplin, Mo., June 8, 1900.

News comes from Chicago that the company organized with a capitalization of $10,000,000, to acquire and develop properties in the Joplin zinc field, will take over 118 mines with fee and leases, and that upwards of 100 mills will be included in the combination. The brokers in the deal are Armour, Haviland & Co., of Chicago. The new company intends to sink twenty 500-foot shafts, to erect ten 1,000-ton mills and to build two large smelters, thus reducing to the lowest possible figure the aggregate cost of mining, milling and smelting.

The continued cutting of zinc ore prices has led to considerable radical talk about remedies One proposition is a complete shut-down of the zinc mines throughout the district, but there is naturally great opposition to such an extreme course. Those who favor such a plan, assert that it is only by curtailing the output in a marked degree and forcing the smelters to shut down their works or pay schedule prices for ore that a permanent remedy can be had. They say that as long as the producers will allow the smelters to rule them, they will have to sell at starvation prices. The Missouri & Kansas Zinc Miners' Association has issued several circulars to the mine owners of the district, arguing in favor of a general shut-down.

A report comes here from Boston that is of much interest in zinc circles, to the effect that now that the United States Oil Co., the United States Mining Co. and other so-called Clark-Coolidge properties have been placed on a strong financial basis, it is proposed to take the American Zinc, Lead & Smelting Co. in hand. The same report says that the last-named company can produce its ore at from $12 to $18 a ton, by reason of the great saving in mining and milling expenses which is made possible through the policy recently inaugurated.

Ferry & Co. of Buffalo, N. Y., have bought the South Free Coinage lease of seventy-four acres at Midway, the consideration being $3,000.

Miss Kate Thorne of Washington, owner of sixteen lots on the Lehigh Drainage Co.'s tract, has made a big strike in a drill hole, having penetrated three distinct levels from a depth of fifty feet to 150 feet. This hole was put down within two feet of the older one on which no ore was reported.

WASHINGTON.

(From Our Special Correspondent.)

Seattle, Wash., June 6, 1900.

Nome is on the tip of every tongue in Seattle nowadays, and it is hard to get people to talk of anything else. The town is experiencing a veritable boom, particularly, of course, in the outfitting lines, but indirectly also in almost every branch of trade and industry. Although the demand for transportation to Nome has been urgent for weeks, the supply has also been abundant, and the Seattle papers are full of advertisements proclaiming the merits of the rival lines. The scenes at the docks are enlivening and most interesting, as the steamers and sailing vessels depart, laden to the guards with merchandise and treasure-hunters. Some complaints have been made that certain vessels engaged in the Nome service have been inadequately inspected, and more numerous complaints are heard that passengers are taken in excess of the legal number. The authorities declare that these criticisms are unfounded in both respects. It is certainly true that some craft have been pressed into service that ought to have been most rigidly inspected before they were released for ocean traffic. On the other hand, the profits in the business are so great under existing conditions that some fine vessels, seaworthy and safe in every respect, have been attracted to the service. On the whole, if one uses reasonable care in selecting one's vessel, no apprehension need be felt concerning the trip. As to the conditions at the end of the journey, it is not so easy to prophesy safely.

The Steamship Charles D. Lane, named for the California millionaire mine-owner, recently arrived from San Francisco en route to Cape Nome. Mr. Lane was one of the 250 passengers. His wife accompanied him on the notable voyage. Mr. Lane also owns in part the steamship Oregon, which sailed from Seattle with 600 passengers about two weeks ago. He is otherwise interested in the Nome trade, and has expended very large sums this spring in repairing and outfitting vessels and steamers for the Cape Nome service. Upon the present trip, the steamer Lane will carry, in addition to an army of fortune hunters, a number of wealthy tourists from San Francisco, who are making the trip to the new El Dorado for pleasure only, and not with the purpose of staying there.

GENERAL NEWS

ARIZONA.

Horace E. Mann, a well-known miner and prospector, has been brought to Phoenix, having become paralyzed from the bite of a gila monster.

The old Dominion mine is said to have produced in May 750,000 tons of copper. Forty carloads of copper bullion were shipped to New Orleans during the month, but a part of this represented the output of the mines in April.

A rich gold strike has been made at Laub City, Cochise county. Assays are said to show for the entire ledge a gold value of $212, while a streak in one open cut shows $428 gold per ton.

It is said in Phoenix that the Congress mine has been sold for $1,500,000 to a New York syndicate, headed by Warner Miller and John W. Mackay.

CALIFORNIA.

Rich placer diggings have been discovered between Granite Wells and Black Lake in Kern county. Many Randsburg people have stampeded to the place and the excitement is growing in the usual snowball way.

A recent oil discovery on the desert is one made near Salt Canyon, Kern county, near the Searles Borax works.

The Rand Rock Mining Co. has shut down its mines for ten days in order to make arrangements for a mill which will grind the ore. The former mill was a failure.

COLORADO.

The value of the gold produced at Cripple Creek in the first five months of the year 1900 was $10,208,028. The total production of the camp up to date has been about $80,000,000.

If Cripple Creek's record for the first five months is taken as an indication of what may be expected in the twelve-month, the total record of 1900 will be 489,123 tons, worth $23,940,736. During March and April a serious difference between mine owners and owners of ore-treatment plants resulted in curtailing production $1,250,000 Water in the mines, an incipient railroad strike and other causes have reduced the yield fully as much. Among these causes has been the shutting down of various important mills in order to reconstruct them or to increase their capacity. These plants, together with entirely new ones, will be in operation soon. The total capacity of these additions will be about double that now available. Conservative estimates place the value of the year's product at $30,000,000.

The profits to stockholders from the $10,236,428 thus far produced in 1900, as disbursed in dividends, are $2,251,929.18. The monthly record is as follows: January, $336,500,00; February, $151,250.00; March, $943,000.00; April, $512,117.18; May, $279,062.00. The dividends total does not include profits invested in equipment of mines the purchase of new ground and other permanent improvements, nor the increase of cash reserves. Close corporations, whose books are not open to the public, hundreds of leasing firms and individual owners of mines whose product is counted in the total yield do not appear as dividend payers. The total profits, excluding only the cost of production, must be close to $7,000,000.

The dividend total for 1900 to date exceeds the 1899 record by $1,011,147.38. For six months of 1899 the total was $1,421,281.66. The June record for the first week is $681,500. This includes $488,000 by Stratton's Independence, $67,500 by Isabella, $75,000 by Elkton, $20,000 by Gold Coin, $10,000 by Consolidated Mines, $6,000 by Amanda and $15,000 by Acacia. Other companies will increase the sum to at least $750,000. This makes the 1900 dividend record to July $3,001,929.18, or $59,365.80 more than twice the total for the first half of last year.

It is now known that negotiations for the San Juan Chief near Silverton have been completed. James L. Hill has sold the mine to New York city people. The purchasers made a careful exploration of the property last season, expending about $20,000, and are now to proceed with its development.

The Peck cyanide mill at Telluride, working upon the tailings of the concentrating mills of that camp, will double its capacity, as the experimental stage has been passed. The returns are satisfactory.

IDAHO.

Great activity is now reported on the Snake River placers and excellent results are uniformly obtained. For more than thirty years this mine has met with but little success, because of the nature of the gold, but two years ago new methods were adopted with excellent results. A new dredge which was put in operation two weeks ago is proving very successful, as has one that has been working steadily for several months, saving 85 per cent of the gold. The new dredge is owned by Baker City, Ore., men, and they have devised an entirely new plan for gold saving. The sand is brought from the bar to the dredge by means of buckets on an endless chain and then dumped into the sluices after passing through a grizzly. The sluices are horseshoe shaped extending around the inside of the boat. At intervals are slides on which the water is so diverted as to deposit the black sand and fine gold, while the coarser material is caught in the ordinary way. At the back of the boat is an arrastra and into this is scraped the material caught on the sides. The arrastra is exactly similar to those so common in the early days, excepting that a larger amount of quicksilver is used, and it has been demonstrated that this saves a great portion of the gold. For 600 miles along the river the placer ground is good and within the next two of three years many more dredges will be constructed to work the rich sands.

MINNESOTA.

A report comes from Duluth that in digging through the debris of the abandoned Ropes gold mine, which they had bought for $2,600, Corrigan, McKinney & Co., a Cleveland iron mining and smelting firm, have found $50,000 worth of gold on the copper plates of the tumbledown mill. Some of these plates were covered half an inch thick with gold amalgam. The entire thickness of the plate is worth $20 an ounce. Residents

of the neighborhood had intended to use these copper plates for roofing their cottages, but had found them too heavy and had thrown them back in the waste dumps.

Besides this pickup of $50,000 in amalgam, most of which has already been sent to the mint, the buyers have found 60,000 tons of waste dump, or tailings from the old mills, that assay $2 to the ton, and they are now preparing to treat this by cyanide. There is also valuable machinery in the mine.

The Ropes gold mine was a local affair, all its stockholders lived near Ishpeming and Marquette, and they were led to think their property valueless. They had been assessed time and again for its operation, and finally when the hard times came on and employees got judgment against the mine for $2,000, they threw up their hands. After a year of idleness they sold for enough to pay the claims and court costs to Corrigan, McKinney & Co. The buyers had no knowledge of value except in the old machinery and possibly the tailings from the mill, and employed a Western expert to look the property over. He had experience in the substitution of gold for copper in battery plates and of the absorbent character of copper for certain ores of gold, and before he tested the tailings he tried the plates. Two tons of old plates, some still in the batteries, some worn out and thrown away, were found, and from the first a gold brick valued at $4,300 was secured by simply scraping the plate. All were then shipped east and are at the mint. Several sacks of dust and sweepings, worth $1,000 or more, have also been found around the old mill. Then the great pile of 60,000 tons of tailings was bored into, found to be worth nearly $100,000 net, and its treatment was ordered.

The Ropes had a record of production before this new find of more than $600,000, proof enough that there was gold in the rocks of the district, but it had never made any money for the stockholders. Corrigan, McKinney & Co. intend to sink the old shaft, make another and mine the property heavily, for it is now evident the ore carries sufficient gold to make it a very profitable operation. It will be the only gold producer on the south shore of Lake Superior, famous for copper and iron.

MONTANA.

Judge Knowles of the United States Court decided on June 2, in favor of the Anaconda, the big mining suit of the Colusa-Parrot against the Anaconda company. The suit involved the ownership of a large part of the Anaconda vein, and the decision is one of the most important ever made in the mining litigation of Montana. Senator W. A. Clark maintained that the Anaconda company had mined considerable ore from beneath the Colusa-Parrot, and that there was a union of the Anaconda and the Colusa-Parrot veins between the 800- and the 1,000-foot levels. The counter contention was that the two veins were distinct, and were cut by the diagonal vein running northwest and southeast. Professor Shaler of Harvard University, Clarence King of California, and numerous other experts from all parts of the country, were engaged on both sides of the case. Judge Knowles decided that there was no union of the veins, and that the Anaconda company had the right to follow its vein.

At the annual meeting of the Parrot Silver & Copper Co. held in Butte, June 5, a statement was submitted purporting to show the financial standing of the corporation and the results of last year's operations. The statement really discloses very little, after the fashion of such "reports," but it does appear that the company declared in dividends $486,000 more than the net earnings for the year, as indicated by the statement. The Parrot, of course, is an Amalgamated property, the dividends accruing to the benefit of the Amalgamated stockholders.

All doubt has been removed as to the intentions of the Anaconda people by their advertisement for bids for 100,000 pounds of excavation and 25,000 pounds of masonry for the new smelter. Manager Klepetko says that the plans provide for the largest and most perfect smelting plant in the world, capable of treating 5,000 tons of ore daily, and with an ultimate capacity of 10,000 tons. It is hoped that the smelter will be in operation within two years. Both the old smelters will be improved and modernized, contracts of large amount having already been let to effect this end.

SOUTH DAKOTA.

The new 100-ton cyanide plant of the Cleopatra Gold Mining Co. on Squaw Creek in the phonolite district is nearly completed. The ore here will run about $10 a ton in gold.

The Omaha Mining Co. will soon put in a turbine at the Whitewood falls, seven miles below Deadwood, to be used in generating electric power for running the mining machinery of the Black Hills. A fall of 100 feet of water can be used, which will furnish 2,000-HP. The company has taken a lease of several million tons of old placer diggings and concentrate deposits above the falls and work will commence this month sluicing the entire deposit. The general average of the bed is about $8 a ton gold. The product will be shipped to this city, where it will be stored until the company gets the Ogden magnetic process in operation

UTAH.

A syndicate is said to be negotiating for 3,500 acres of coal lands at Price, Utah, to be used in connection with a mammoth iron and steel plant

It is reported from Salt Lake City, that the Mercur Gold Mining & Milling Co. and De La Mar's Mercur Mines Co. will consolidate on a basis of two-thirds for the De La Mar Co. and one-third for the Mercur Co. The combined properties will own seventy-four mining claims, covering over 500 acres. The new company will be known as the Consolidated Mercur Gold Mining Co., and will be capitalized at $5,000,000—1,000,000 shares, of which 200,000 will remain in the treasury.

The lead producers of Utah have taken initial steps toward forming a state organization. The combination will work in harmony with the American Smelting & Refining Co., and will pay especial attention to export business.

The smelter to be erected by the United States Mining Co. is designed to have a capacity of 500 tons per day at the start. It is said that the contract for the smelter will be placed at once. Duncan McVichie, who has had charge of the De La Mar property, will soon become active manager, it is said, of the United States Mining Co., and will begin at once the erection of heavy ore bins in which to store the output of the mines.

WASHINGTON.

The exodus to Nome has not accounted for the entire Alaskan emigration, because southeastern Alaska and the Klondike have both been favored by large numbers of prospectors. Although little is said about it, it is a fact, as careful observers in the Puget Sound region know, that these better-known sections of Alaska will receive a liberal portion of the new prospectors.

On Kanaka Bay, San Juan Island, copper, gold, silver and lead are being mined. As the mineral districts are close to tide water, vessels can transport the ores to a smelter at a cost of $1 a ton or less. The location of the mines, therefore, is particularly convenient, and some of the veins are said to carry ores ranging from $30 to $40 per ton.

President C. W. Thompson of the Washington Co-operative Mining Syndicate, Tacoma, writes glowingly of the prospects of his enterprise. The Syndicate has not yielded to the natural temptation to make ventures in Alaska or elsewhere, but has confined its operations entirely to Pierce county, and means to do so until the Carbon River mines are operated.

Eastern capital has recently been obtained for the further exploitation of some partly developed mines in the Okanogan district. Some excellent mines will doubtless result from this activity.

IRON AND STEEL

A MONSTER SHAFT: The Republic Iron & Steel Co. and the American Steel Hoop Co. have begun at Duluth, Minn., the construction of what will probably prove to be the largest mining shaft in the Lake Superior region.

CARNEGIE STEEL CASTLE: Mr. Carnegie, as everybody knows, is a great believer in steel, and he has astonished the Highlanders by his lavish use of steel in the erection of additions to the ancient pile of buildings known as Skibo Castle. The new structures are made largely of steel, manufactured especially for the purpose at the Carnegie plant near Pittsburg.

STEEL AND WIRE'S NEW PLANS: According to reports from Chicago, a sweeping change in the business methods of the American Steel & Wire Co. has been decided upon, in virtue of which that company will be free from both the Federal and National Steel Companies. Instead of obtaining steel billets and rods from this source, the American Steel & Wire Co. will make them from its own raw materials, digging the ore from its own mines, coking the coal in its own ovens, and completing the process in its own furnaces.

SHIPMENTS OF SOUTHERN PIG IRON: The following is the record of shipments of pig iron and pipe from the southern fields in April: From Alabama and Tennessee, 109,978; from Birmingham district alone, 69,933 tons; for export, 8,651 tons; cast iron shipments from Tennessee and Alabama, 5,858 tons; from Birmingham district alone, 1,818 tons; for export, 1,577 tons. Shipments in all classes except export pipe, which shows an increase, are a falling off from April of 1899. The decrease is probably due to the fact that the furnace and warrant yards are empty now, whereas they had large stocks on hand last April. Shipments are now based on the current production of the furnaces.

SUMMER PRODUCTION: Rogers, Brown & Co say in their weekly letter from Cincinnati about the iron and steel outlook: "The reports now being received indicate that production will be decreased during June and July, by reason of numerous furnaces going out of blast for repairs. It is not thought that there will be much anxiety to hurry repairs and get them into operation again. The limited demand for iron and reduction in prices are causing a number of furnaces to consider seriously the advisability of stopping soon, and unless cost of production can be cut down, they will be obliged to do so. It is thought that normal conditions can be resumed without much hardship on consumers, although there will be quite a heavy tonnage of high-priced orders to be taken care of, and this will to some extent cut into the profits made last year by those fortunate enough to have long time contracts at low figures on which a good margin was made. It is a notable fact in the pig iron trade that cases are very rare where a furnace company defaults on a contract on an advancing market, and the consumers as a rule live up to their contracts faithfully on a declining market. There exists a spirit of mutual accommodation between furnace companies and their customers, so that legal controversies seldom arise."

COAL AND COKE

BIG MAY FIGURES: Anthracite production in May proves to have been much larger than was expected, the tonnage amounting to 3,800,000. This exceeds the output of last year over 250,000 tons, and the output of April, 1900, about 600,000 tons.

DOMINION COAL CO: The report of the Dominion Coal Co. for its fiscal year ended February 28, has just been issued and shows net receipts of $746,926 for the year. This compares favorably with previous years, and the report in general shows substantial progress.

At the annual meeting held in Boston, June 7, the following directors were elected: H. M. Whitney, Lord Strathcona, Sir Wm. C. Van Horne, Hon. David Mackeen, H. F. Dimock, James Phillips, Jr.; W. B. Ross, J. S. McLennan, F. S. Pearson, A. H. Paget, Jas. Ross.

President Whitney made interesting remarks about the company as follows:

"Since the organization of the company in 1893, efforts to open new markets for the coal have been diligently pursued with quite satisfactory results. The coal has now established its value for all purposes, and sales hereafter will be limited only to the quantity that the company can from time to time produce. As there are upwards of 4,000,000,000 tons of coal in sight there is no danger of the supply being exhausted.

"In order to introduce the coal, sales have been made at exceedingly low prices, but notwithstanding this the net earnings of the company have been sufficient to pay all the fixed charges on $3,000,000 of bonds and $2,000,000 of preferred stock, together with the interest on the floating debt, a large yearly contribution to the sinking fund for the retirement of the bonds, with a surplus of from 1% to 2% on the common stock, most of which has been charged to new construction. The sales heretofore have averaged from 1,000,000 to 1,200,000 tons. Hereafter the sales will be more than double and the net average revenue per ton is not likely to be any less.

"This increased business will enure to the benefit of the common stockholders, and the directors feel confident of being able to begin dividends on the common stock during the current year.

"To provide for such a large increase in our business we shall have to open three new mines."

NEW INCORPORATIONS

The name, address and capital stock of corporations recently announced, and the name of one incorporator Unless otherwise specified, companies are organized to conduct a mining business. Address of the incorporator named is same as that of company, except when stated otherwise.

CALIFORNIA.

GLENN COUNTY OIL & COAL CO., Willows; $250,000; H. B. Elliott.

SURE SHOT OIL PRODUCING CO., Reedley; $100,000; J. Fairweather.

NORTHERN ALASKA MINING CO., Oakland; $200,000; T. Foster.

NORTH WHITTIER OIL CO., Los Angeles; $200,000; M. S. Hellman.

PURE GOLD MINING & MILLING CO., San Diego; $1,000,000; B. F. Jones.

SECURITY MINING, INVESTMENT & TRADING CO., Oakland; $200,000; E. L. Kornfeld.

SUNSET MINING CO., San Francisco; $10,000,000; F. J. Baker.

HICKS OIL CO., Visalia; $250,000; E. Richardson

RIVERSIDE CRUDE OIL CO., Los Angeles; $600,000; J. P. Percival.

EASTERN STAR MINING CO., San Francisco; $150,000; F. A. Leach, Oakland.

PACIFIC SLOPE OIL & DEVELOPMENT CO., Bakersfield; $200,000; F. Retelhut.

GOLDEN GATE MINING, MILLING & POWER CO., Stockton; $100,000; M. S. Thresher.

SEARCHLIGHT OIL CO., Los Angeles; $1,000,000; J. Conrad.

PLYMOUTH ROCK OIL CO., Oakland; $500,000; W. W. Dames.

CALIFORNIA ROCK OIL CO., San Francisco; $1,000,000; D. Hayne.

SHAMROCK OIL CO., San Francisco; $500,000; B. E. Green.

MOODY GULCH OIL CO., Los Angeles; $150,000; J. L. Murphy.

SAN ANTONIO OIL CO., Los Angeles; $150,000; J. H. C. Van der Lohe.

CALIFORNIA CONSOLIDATED OIL STOCK CO., Whittier; $500,000; C. J. Vernon.

ORO BLANCO MINING CO., San Diego; $1,000,000; D. C. Collier, Jr.

RELIEF GOLD QUARTZ MINING, MILLING & DEVELOPMENT CO., Angels Camp; $200,000; J. H. Condy.

EBRO BONITA OIL CO., San Francisco; $175,000; A. S. Phelan.

VANDIVER PETROLEUM CO., Fresno; $250,000; W. T. Manpin.

LEAVITT DEVELOPMENT CO., Susanville; $25,000; B. H. Leavitt.

LEAVITT LASSEN OIL CO., Susanville; $300,000; L. C. Stiles.

IMPERIAL AMERICAN MINING CO., Los Angeles; $1,000,000; J. K. Mulky, Pasadena.

COMET OIL CO., Bakersfield; $200,000; C. A. Canfield.

SAN FRANCISCO GROCERS' OIL CO., San Francisco; oil business; $500,000; G. Alpens.

BRITISH AMERICAN OIL CO., Los Angeles; $500,000; C. W. Stewart.

ELK OIL CO., Los Angeles; $500,000; C. M. Wood.

LUCKY JIM GOLDEN TREASURE CONSOLIDATED MINING CO., Stockton; $400,000; E. H. Williams.

LORD ROBERTS OIL CO., Hanford; $20,000; A. V. Taylor.

PORTERVILLE OIL & MINING CO., Porterville; $100,000; A. G. Schulz.

NUGGET DREDGING CO., Oakland; $20,000; A. L. Stone.

PHILLIPS MINING & TRADING CO., San Francisco; $30,000; M. Silberstein.

CAPE NOME MINING, DREDGING & IMPROVEMENT CO., Stockton; $100,000; J. J. Smith.

YELLOW KING MINING CO., Fresno; $25,000; C. S. Cox.

SAN JOAQUIN VALLEY OIL CO., Fowler; $250,000; P. W. Haster.

PALOMA OIL CO., Los Angeles; $300,000; C. W. Thompson.

SINOOK MINING CO., San Francisco; $47,500; R. G. Byxbee, Fruitvale.

ALASKA & CAPE NOME CO., Oakland; $100,000; M. J. Keller.

ROSELLA MINING & MILLING CO., Stockton; $50,000; J. McCormick

OPHIR OIL & DEVELOPMENT CO., Fresno; $500,000; E. E. Webster.

EMPIRE OIL & DEVELOPMENT CO., Bakersfield; $300,000; W. G. Sylvester.

BIG OAK MINING CO., Fresno; $100,000; J. Scott.

GLOBE OIL CO., Coalinga; $500,000; W. Kinney.

ELEANOR OIL CO., Los Angeles; $300,000; E. J. Young.

COLORADO

SAN ANDREAS MINING CO., Colorado Springs; $100,000; A. H. Moffet.

TERROR MINING CO., Eldorado; $100,000; R. M. Fuller, Boulder.

JOPLIN CRIPPLE CREEK MINING CO., Colorado Springs; $500,000; W. S. Montgomery.

HALLAWOOD GOLD & COPPER MINING CO., Canon City; $100,000; C. R. Stedman.

BLOCK TWELVE GOLD MINING CO., Cripple Creek; $1,000,000; E. Nicholson, Colorado Springs.

LINCOLN MINES MINING & MILLING CO., Cripple Creek; $2,000,000; E. P. Secor.

IMPERIAL COAL, COKE & IRON CO., Denver; $500,000; G. W. Ware.

LAWRENCE DEVELOPMENT & MINING CO., Colorado Springs; $30,000; E. M. Robertson.

BURNT TIMBER GOLD MINING CO., Durango; $40,000; F. L. Freeman.

GOLDEN STAR MINING & MILLING CO., San Luis; $80,000; G. Evans.

BRITISH & AMERICAN DREDGE & MINES CO., Denver; $550,000; T. B. Gillespie.

WHITE GOLD MINING CO., Cripple Creek; $125,000; J. M. White.

METALS REDUCTION CO., Denver; $50,000; T. Harrison.

VOLUNTEER MINING CO., Colorado Springs, $100,000; L. Ehrich.

MISSOURI VALLEY MINING CO., Denver; $100,000; G. M. Shelley.

NUGGET MINING CO., Colorado Springs; $625,000; J. J. Key.

LUCKY DAY GOLD MINING CO., Canon City; $1,000,000; E. Colwell.

BATTLE LAKE CONSOLIDATED COPPER CO., Colorado Springs; $250,000; F. W. Stehn.

DELAWARE.

SOUTH AMERICAN TRADING CO., Dover; $100,000; A. B. Hodges, Taunton, Mass.

NEW ERA DEVELOPING CO., Dover; $15,000; J. Virdin, Dover.

ILLINOIS.

CHICAGO & WESTERN COAL CO., Chicago; dealing in fuel; $5,000; D. W. Scanlan.

ALTA BERT DREDGING & MINING CO., Le Roy; $25,000; T. Clarey.

BARKER COAL CO., Chicago; $5,000; H. W. Barker.

INDIANA.

INDIANAPOLIS LEAD & ZINC CO., Indianapolis; $50,000; G. W. McVicker.

IOWA.

MARGARET COAL CO., Washington Township; $5,000; G. P. Barnes, What Cheer.

PELHAM MINING & DEVELOPMENT CO., Ottumwa; $125,000; W. S. Pelham.

SPRING CREEK LEAD & ZINC CO., Des Moines; $50,000; A. H. Mabis.

COLFAX COAL & MINING CO., Colfax; $30,000; W. A. Seevers, Oskaloosa.

MAINE.

LING GOLD MINING CO., Portland; $100,000; E. I. Drisco, Boston, Mass.

MICHIGAN.

NEW BUFFALO ALABASTINE & MINERAL PAINT MANUFACTURING CO., New Buffalo; mining and manufacturing mineral paint, etc.; $10,000; J. Scholtes.

ROBERT GAGE COAL CO., Bay City; $80,000; Emily J. Vance.

MINNESOTA.

BRITISH AMERICAN GOLD MINING CO., Minneapolis; $500,000; P. B. Fontaine.

EUREKA COAL MINING CO., Richmond; $70,000; J. C. Weber.

MISSOURI.

ASPEX DEVELOPMENT CO., Kansas City; $3,000; H. J. O'Brien.

NEW ENGLAND MINING CO., Kansas City; $20,000; H. D. Hayward.

LITTLE FOUR MINING & MILLING CO., Neosho; $40,000; C. E. Davis.

GREYHOUND ZINC & LEAD MINING & MILLING CO., St. Louis; $240,000; F. Hoefert.

AXIOM MINING & MILLING CO., St. Louis; $100,000; A. L. Stocke.

VAN NOY MINING CO., Kansas City; $100,000; I. C. Van Noy, Kansas City.

NEW JERSEY.

DONNELLY DUNHAM COAL MINING CO., Jersey City; $300,000; W. M. Mason.

GEORGE B. NEWTON & CO., Camden; mining coal, etc.; $1,500,000; F. T. Patterson.

CHICAGO & OHIO OIL CO., Jersey City; oil business; $1,000,000, H. C. Balcom, New York.

CHEROKEE MINING CO., Jersey City; $300,000; W. H. Wilson.

PAULDING GOLD MINING CO., Camden; $50,000; F. R. Hansell.

MONROE GOLD MINING CO., Jersey City; $250,000; S. J. Holmes.

NEW YORK.

ADIRONDACK GOLD MINING CO., Saranac Lake; $1,000; A. E. Copp, Albany.

OREGON.

HELENA MINING CO., Portland; $1,000,000; P. J. Jennings.

GOLD POINT MINING CO., Portland; $10,000; E. N. Wheeler.

FREELAND CONSOLIDATED MINING CO., Salem; $1,000,000; A. White.

TENNESSEE

NEEMORE COAL CO., Chattanooga; $100,000; J. B. Milligan.

NEW M'NABB COAL CO., Chattanooga; $10,000; T. R. Preston.

VIRGINIA.

SOUTH MOUNTAIN MINING CO., Newport News; $250,000; R. P. Orr.

VIRGINIA COAL & COKE CO., Abingdon; $300,000; R. M. Page.

WASHINGTON.

SOUTH MOUNTAIN CONSOLIDATED MINES TUNNEL CO., Spokane; $15,000; G. A. Sonneman.

NORTON SOUND PLACER MINING CO., Seattle; $10,000; J. Corrall.

NINETEEN MINING CO., Seattle; $10,000; I. T. Cole, Washington.

LEO & TIBRA CO., Seattle; mining business; $7,400; Helen A. Johnson.

WEST VIRGINIA.

TUG RIVER COAL & COKE CO., Welch; general coal and coke business; $500,000; D. J. F. Strother.

MINNIE MOORE MINING CO., Chicago, Ill.; $500,000; E. A. King.

QUEEN GROUP MINING & SMELTING CO., New York City; $1,000,000; C. J. Bushnell.

CHAPMAN COAL & COKE CO., Casperton; $250,000; M. D. Chapman.

CENTRAL OHIO LEAD & ZINC CO., Delaware, O.; $100,000; L. H. Hozmiller.

SONORA COAL CO., Philadelphia, Pa.; general coal and coke business; $5,000,000; J. K. Gittens.

TIN CUP MINING & SMELTING CO., New York City; $500,000; C. W. Skinner.

CANTON DUENWEG LEAD & ZINC CO., Canton, O.; $50,000; C. A. Stolberg.

M'GRAW COAL CO., Grafton; general coal and coke business; $300,000; J. T. McGraw.

CENTURY IRON CO., New York City; general iron and steel business; $750,000; H. A. Kelly, Cleveland, O.

BOSTON-CHEROKEE ZINC & LEAD CO., Boston, Mass.; $300,000; C. M. Thayer.

INTERNATIONAL COAL CO., New York City; $1,000,000; C. F. Frothingham.

WESTERN KENTUCKY MINING CO., Louisville, Ky.; $500,000; W. J. McConthy.

WYOMING.

WAGNER GREEN MINING & MILLING CO., Encampment; $1,000,000; J. H. Stoddard, Chicago.

DIVIDENDS DECLARED

The Calumet and Hecla has declared a dividend of $10 per share, payable June 28. With this million dollar disbursement, the Calumet and Hecla has paid to its stockholders almost $70,000,000.

The American Steel and Wire Co. has declared quarterly dividends, payable July 2, on both its preferred and common stock of $1.75.

The National Lead Co. has declared a quarterly dividend of $1.75, payable June 15, on its preferred stock.

The Maryland Coal Co. has declared a semi-annual dividend of $2 per share, payable June 30, on its preferred stock.

The National Steel Co. has declared a quarterly dividend of $1.75, payable June 30, on its preferred stock.

The Republic Iron & Steel Co. has declared a quarterly dividend of $1.75, payable July 2, on its preferred stock.

The Tamarack Co. will pay a semi-annual dividend of $7 per share on June 29, and the Osceola one of $3 per share on June 22.

The Cordell Zinc Co. will pay a monthly dividend of 5c. per share on June 15; the Empire State, Idaho, one of 30 cents on June 15; the New York and Hond. Ros., one of 10 cents on June 16.

MINING STOCK QUOTATIONS IN VARIOUS MARKETS

Mining stocks multiply incessantly, and we cannot undertake to record them all. We keep, however, complete records of all mining stocks, wherever listed, and we shall be glad to furnish any subscriber on request, with detailed information about quotations. The prices given below are in most cases those current at the close of business on the day we go to press—two days before the date of issue.—*Mining and Metallurgical Journal.*

BOSTON.

Adventure	4 00	Old Colony Cop	3 50
Allouez	1 75	Old Dominion	17 00
Anacon da	40 00	Osceola	19 00
Arcadian	10 00	Parrott	39 00
Arnold	5 25	Quincy	133 00
Atlantic	22 00	Rhode Island	4 25
Bingham	10 00	Santa Fe	1 75
Bonanza	10 00	Santa Maria	1 00
Bonanza	—	Tamarack	182 00
B. Scotia & Mont	208 00	Tecumseh	3 00
Butte & Boston	60 00	Tri Mountain	7 00
Calumet & Hecla	720 00	Victoria	2 25
Centennial	16 25	United States	0 25
Cochiti	10 25	Utah Con	25 00
Copper Range	—	Washington	1 00
Dominion Coal	30 75	White Knob	16 00
Franklin	12 75	Winona	3 00
Isle Royal	2 50	Wolverine	88 00
Merced	5 00	Wyandotte	1 00
Mohawk	13 75	Zinc	12 00

NEW YORK

A Lams Con	17	Golden Fleece	28
Alamo	14	Gould & Curry	10
Alice	40	Hale & Norcross	22
Amalgama'd	87 50	Horn Silver	1 25
Amador Con	40 50	Iron Silver	60
Anaconda G	33	Isabella	1 25
Argentum	21	Jack Pot	58
Best & Belcher	22	Julia Consol	—
Breece	—	King & Pemb	—
Brit. Col	10 25	La Crosse	14
Brunswick	25	Lackawaxen	06
Caledonia	50	Little Chief	16
Caribou		Mexican	17
Chollar	18	Mollie Gibson	23
Chrysolite	01	Moulton	30
Con. T stock	03	Mount Rosa	77
Con. T bonds	03	Occidental	10
Con. T. script	04	Ontario	7 00
Con. Cal. & Va	1 35	Ophir	95
Cr & Cr. Creek	13	Pharmacist	12½
Crescent		Phœnix	07
Cripple C'k Con	13 75	Pinnacle	20
Crœsus	—	Plymouth	10
Crown Point	08	Portland	2 90
Damon	20	Potosi	10
Deadwood Ter	50	Quicksilver	1 50
Elston	1 20	Quicksilver pr.	7 50
Eureka Con	15	Savage	15
Extn De Smet	06	Sierra Nevada	24
Findlay	15	Small Hopes	50
Garfield	16	Specimen	13
Standard	3 85	Utah	—
Tornado	52	Victor	1 00
Union	40	Work	31
Utah Con	17	Y Bell Jacket	12

NEW YORK INDUSTRIAL STOCKS.

Amer. Smelt	30 75	Nat. Lead pf	04 00
Am. Sug. Ref. pf	109 00	Pressed Steel Car	45 25
Am. S. & W.	34 50	Pressed Car pf	83 00
Am. S. & W. pf	74 00	Republic I.	11 00
Col. F. & I.	32 75	Republic I. pf	56 25
Fed Steel	22 00	Sloss Oil	545 00
Fed Steel pf	65 75	Tenn. C. & I.	67 75
Nat Lead	18 00		

TORONTO.

Athabaska	24	No. Belle	02½
Big Three	05	Olive	18
B. C. G. Fields	03	Republic	1 00
Crow's Nest	50 00	Van Anda	05
Dardanelles	02½	Virtue	1 00
Deer Trail No. 2	06	Wa Eagle	1 51 00
Fairview	07	Waterloo	05½
Gold n Star	16	White Bear	02½
Knob Hill	60	Winnipeg	15
Minnehaha	04		

COLORADO SPRINGS.

Acacia	33½	Independence	61¾
Alamo	14½	Ingham	20
Anaconda	35	Isabella	1 25½
Anchoria	05	Jack Pot	58½
Argentum	10	Keystone	17½
Bankers	14	Lexington	17¾
Battle Mount	25	Mary Cashen	24½
Blue Bell	12	Maton	31
C. C. & G.	14	Moon Anchor	90
C. C. & M.	00½	Mount Rosa	77
Columbine	15½	National	11¾
Damon	20	Nugget	20
Dante	13	Ophir	61
Elkton	1 20	Orphan	10
El Paso	11	Pharmacist	12
Findlay	14½	Pinnacle	19¾
Garfield	16	Raven	76
Gibson	23	Rawlings	35
Gold Coin	5 26	Specimen	13½
Golden Fleece	30	Tommy	25
Gold King	1 00	Tornado	53
Gold Knob	14½	Union	40
Gold Sovereign	10	Vindicator	1 48
Gould	50	Work	31
Hart	16	Zenobia	15

SALT LAKE.

Anchor	35	Joe Bowers Ex	01
Ajax	40	Low Mam'oth	02
Alice	10	Little Chief	01
Bullion Beck	4 50	Mammoth	2 21
Cent. Eureka	23 40	Mercur	5 85
Chloride Point	09	May Day	1 02
Daly	1 75	North Light	08½
Daly West	18 00	Omaha	01
Dalton & Lark	06	Ontario	7 00
Dalton	02½	Petro	24
Dexter	1 00	Rich Anaconda	14
Daisy	00	Sunshine	01
Eagle	—	Swansea	3 90
Eagle & Blue Bell	00	Sc. Swansea	1 21
Emerald	00	Sunbeam	07½
Four Aces	04½	Sacramento	23
Geyser Marion	03½	Silver King	48 00
Galena	12	Star Consol	20½
Grand Central	5 47½	Shower Con	00
Golden Eagle	07	Tetro	04½
Horn Silver	1 25	Utah	50½
Homestake	—	Valeo	58
Ingot	05	W. M't'n Placer	00
Joe Bowers	05½	Yankee Con	10

SPOKANE.

Ben Hur		Morning Glory	03
Black Tail	17½	Mountain Lion	50
Butte & Boston	03	Pearl	—
Deer Trail No. 2	06½	Princess Maude	03½
Golden Harvest	01½	Quilp	24
Insurgent	01	Republic	02
Jim Blaine	13	Tom Thumb	17½
L. Pine Bur. Con	15		

SAN FRANCISCO.

Alpha Con	04	Kentucky Con	01
Alta	02	Lady Wash Con	02
Andes	06	Mexican	19
Belcher	19	Occidental	12
Best & Belcher	25	Ophir	66
Bullion	01	Overman	16
Caledonia	1 00	Potosi	18
Challenge	13	Bag Belcher	01
Chollar	19	Savage	17
Confidence	60	Sierra Nevada	27
Con. Cal. & Va	1 45	Standard	4 30
Con. Imperial	01	St. Louis	12
Crown Point	08	Syndicate	10
Gould & Curry	12	Union Con	20
Hale & Norcross	24	Utah Con	12
Julia	01	Yellow Jacket	14
Justice	08		

MEXICO.

Name of Company	State	Price
Amistad y Concordia	Hidalgo	18
Angustias	Guanajuato	190
Arevalo y Anexas	Hidalgo	200
Asturiana y Anexas	Zacatecas	145
Barradon y Cabras	Durango	30
Batallon de Medina	Hidalgo	65
Cabezon y Anexas	Zacatecas	10
Candelaria de Pinos		250
Capuzayas	Durango	10
Carmen	Hidalgo	250
Cinco Senores y Anexas	Guanajuato	200
Concepcion y Anexas	S. Luis Potosi	270
Coronas	Mexico	175
El Oro	Guanajuato	
El Oro pool	Guanajuato	—
Esperanza y Anexas	Mexico	1,250
Gloria	Guadalupe	
Guadalupe	Guanajuato	205
Luz de Borda y Anexas	Michoacan	12
Luz de Maravillas	Hidalgo	100
Palacios		90
Palo Alto de Santo	Zacatecas	50
Pinones	Durango	—
Rafael y Anexas	Hidalgo	800
Real del Monte	Hidalgo	550
Restauradora	Durango	10
Rosario y Anexas	Durango	—
San Francisco	Hidalgo	170
San Rafael aviado	Hidalgo	—
San Rafael del Oro	Hidalgo	—
Sta. Maria de la Paz	S. Luis Potosi	1,000
Soledad	Hidalgo	230
Sorpresa		300
Trinidad Aviador	Guanajuato	65
Trinidad Aviado	Guanajuato	15
Tlauzingo	Puebla	—
Union Hacienda	Hidalgo	200
Zona Min. de Paz	Guanajuato	8

NOTE—Mexican stocks are figured on the basis of Mexican silver.

THE METAL MARKETS

The following quotations are those current in New York City, unless otherwise stated, at the time we go to press—usually two days before the date of publication. We take particular pains to obtain trustworthy figures.—The Mining and Metallurgical Journal.

SILVER: Little business has come from the Continent, and possibly less from India, so that the London market has been spiritless. Some silver, however, is still bought for India on both private and government account. Prices have remained firm, notwithstanding the apathy of the market, closing at 60 for bar silver. Mexican dollars are quoted at 47¼.

COPPER: This metal has been weak as for some time past, and not even the threatened stoppage of the Calumet supply was sufficient to reverse the tendency. If the Calumet fire, however, had proved to be as serious as it looked at one time, quotations could hardly have failed to reflect the important fact; for the Calumet and Hecla mine furnishes not far from 10 per cent of the entire world's production. Opinion as to the future course of the market is divided as usual, but no decided immediate change in either direction is expected by the best judges. 16¼@16½c. was the closing price for Lake.

MINOR METALS: The continuous fall in lead within the last few weeks has made buyers unusually wary, and they are reluctant to place orders even at the present low level without special concession. The price has continued to decline, therefore, standing now at 3.87½c. New York. The same conditions characterize the St. Louis market, where the closing quotation was 3.80c. In spelter, business has been reasonably active, with transactions effected at 4.37½c. New York and 4.25c. St. Louis. Tin has shown more steadiness than usual, though the general trend has been downward, in sympathy with the other markets. At the close, 29@29.50c. was the ruling quotation.

IRON AND STEEL: An upward reaction in the iron market is due and cannot be far away. With Bessemer pig at $20 and Grey forge at $18, basic prices may be regarded as almost normal. It will not do to consider as normal the quotations made in the depth of depression a few years ago. Conditions now are essentially different both here and abroad. Elsewhere in this issue we quote the Hon. Abram S. Hewitt on this point. Buyers of iron and steel who think the present level of prices much too high, would do well to heed the words of this wise and trustworthy counselor.

COAL AND COKE: The conditions in the anthracite trade are as favorable as could reasonably be expected at this time of year. Although the production for the first five months of the year amounted to 17.9 million tons as compared with 16.6 last year, yet almost all of this surplus product seems to have gone into users' hands, as there are no large visible accumulations at distributing points. This year, moreover, it is altogether likely that production during the dull season will be kept down to fit the market. $3.65 net per ton for the best quality of stove is the New York Harbor price.

In the bituminous branch of the trade, conditions are likewise promising. The domestic demand is at least fair, and the foreign trade is assuming tangible, measurable proportions. The large amount of preliminary work that has been devoted to foreign business in recent months is now resulting in actual export cargoes. Clearfield coal may be quoted at $2.60 New York and at $2.25 Philadelphia.

The unsettlement in the iron trade has naturally disordered the coke trade, throwing the supply for the moment out of proportion to the demand. 2,000 ovens have been closed at Connellsville, reducing the output about 20,000 tons a week. $2.75 for furnace and $3 for foundry may be deemed the ruling quotations.

BUYERS' GUIDE

AIR COMPRESSORS
Edw P Allis Co, Milwaukee, Wis
M C Bullock Mfg Co, Chicago, Ill
Colorado Iron Wks, Denver, Colo
W H Emanuel, Denver, Colo
Fairbanks, Morse & Co, Chicago, Ill
Gates Iron Works, Chicago, Ill
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, 8 Francisco, Cal
Ingersoll-Sergeant Drill Co, N Y City
Parke & Lacy Co, 8 Francisco, Cal
Willis Shaw, Chicago, Ill
Sullivan Machinery Co, Chicago, Ill
Union Gas Engine Co, 8 Francisco, Cal
Weber Gas & Gasoline Eng Co, Kansas City, Mo
J Wigmore & Sons Co, Los Angeles, Cal

AMALGAM PLATES
Edw P Allis Co, Milwaukee, Wis
E G Denniston, 8 Francisco, Cal
Joshua Hendy Machine Wks, 8 Francisco, Cal
Parke & Lacy Co, 8 Francisco, Cal
San Francisco Novelty & Plating Wks, 8 Francisco, Cal
John Taylor & Co, 8 Francisco, Cal

ANTI-FRICTION METALS
Henshaw, Bulkley & Co, 8 Francisco, Cal
Parke & Lacy Co, 8 Francisco, Cal

ARC DYNAMOS
W H Emanuel, Denver, Colo

ASBESTOS GOODS
California Anti-Caloric Co, 8 Francisco, Cal
G C Fowler, 8 Francisco, Cal

ASSAYERS AND CHEMISTS
W O Abbott, Tombstone, Ariz
Lew F Asbury, Los Angeles, Cal
Baker & Co, N Y City and Newark, N J
E F Burlingame & Co, Denver, Colo
Bandy & Manning, Denver, Colo
Wm M Courtis, Detroit, Mich
Hamlin & McGibson, Philadelphia, Pa
Carnegie Hors A, Leadville, Colo
Jas Irving & Co, Los Angeles, Cal
Ogden Assay Co, Denver, Colo
R A Perry, Los Angeles, Cal
John T Reed, San Bernardino, Cal
D W Reckhart, El Paso, Tex
Ricketts & Banks, N Y City
Selby Smelting & Lead Co, 8 Francisco, Cal
Simonds & Wainwright, N Y City
State Ore Sampling Works, Denver, Colo
Wade & Wade, Los Angeles, Cal
Weis & Gibson, Chicago, Ill
Henry E Wood, Denver, Colo

ASSAYERS' SUPPLIES
Wm Ainsworth & Sons, Denver, Colo
Baker & Adamson Chemical C, Easton, Pa
Baker & Co, N Y City and Newark, N J
F W Braun & Co, Los Angeles, Cal
Consolidated Kansas City Smelting & Refining Co, Argentine, Kan
Denver Fire Clay Co, Denver, Colo
H Kohlbusch, Sr, N Y City
Queen & Co, Philadelphia, Pa
Richards & Co., Ltd, N Y City
Roessler & Hasslacher Chemical Co, N Y City
Schoellkopf, Hartford & Maclagan, N Y City
Smith & Thompson, Denver, Colo
John Taylor & Co, 8 Francisco, Cal
Henry Troemner, Philadelphia, Pa
Western Chemical Co, Denver, Colo

BABBITT METAL
Joshua Hendy Machine Wks, 8 Francisco, Cal
Parke & Lacy Co, 8 Francisco, Cal

BAR IRON AND STEEL
J Wigmore & Sons Co, Los Angeles, Cal

BANKERS AND BROKERS
Lytle & Co, Galena, Kan
Morgan-Watson Mining & Construction Co, Cleveland, O

BELT DRESSING
Jos Dixon Crucible Co, Jersey City, N J

BELTING
Edw P Allis Co, Milwaukee, Wis
Gutta Percha & Rubber Mfg Co, 8 Francisco, Cal
Goodyear Rubber Co, 8 Francisco, Cal
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, 8 Francisco, Cal
Jeffrey Mfg Co, Columbus, O
Link-Belt Machinery Co, Chicago, Ill
Parke & Lacy Co, 8 Francisco, Cal
Quaker City Rubber Co, Philadelphia, Pa
Robins' Conveying Belt Co, N Y City
Shultz Belting Co, St Louis, Mo
S S Machinery Co, Denver, Colo
J Wigmore & Sons Co, Los Angeles, Cal

BLACK DIAMONDS
Theo Lexow, N Y City
I C Yawger, N Y City

BLASTING BATTERIES, ETC.
Metallic Cap Mfg Co, N Y City
J Wigmore & Sons Co, Los Angeles, Cal

BLOWERS
Parke & Lacy Co, 8 Francisco, Cal

BOILERS
Edw P Allis Co, Milwaukee, Wis
Baker Iron Works, Los Angeles, Cal
California Anti-Caloric Co, 8 Francisco, Cal
Colorado Iron Works, Denver, Colo
Fairbanks, Morse & Co Chicago, Ill
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, 8 Francisco, Cal
Jas Leffel & Co, Springfield, O
Ridgerwood Mfg Co, N Y City
Chas C Moore & Co, 8 Francisco, Cal
Murray Iron Works, Burlington, Iowa
Parke & Lacy Co, 8 Francisco, Cal
Ruggles-Coles Engineering Co, N Y City
S S Machinery Co, Denver, Colo
Wm B Scaife & Sons, Pittsburg, Pa
J Wigmore & Sons Co, Los Angeles, Cal

BOILER COMPOUNDS
Geo W Lord, Philadelphia, Pa

BOILER COVERING
California Anti-Caloric Co, 8 Francisco, Cal

BOILER TUBE CLEANERS
Coggeshall Mfg Co, N Y City
G C Fowler, 8 Francisco, Cal

BOOKS
Theo Audel & Son, N Y City
Mining & Metallurgical Journal, N Y City
Philadelphia Book Co, Philadelphia, Pa
D. Van Nostrand Co, N Y City

BRASS GOODS
American Injector Co, Detroit, Mich
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, 8 Francisco, Cal

BRIQUETTING MACHINERY
Parke & Lacy Co, 8 Francisco, Cal

BUCKETS
Joshua Hendy Machine Wks, 8 Francisco, Cal
Jeffrey Mfg Co, Columbus, O
Link-Belt Machinery Co Chicago, Ill
Parke & Lacy Co, 8 Francisco, Cal
Thomson & Boyle, Los Angeles, Cal
Weber Gas & Gasoline Eng Co, Kansas City, Mo
J Wigmore & Sons Co, Los Angeles, Cal

CAP CRIMPERS
Metallic Cap Mfg Co, N Y City

CARBONS
American Diamond Rock Drill Co, N Y City
M C Bullock Mfg Co, Chicago, Ill
Joshua Hendy Machine Wks, 8 Francisco, Cal
Theo Lexow, N Y City
Sullivan Machinery Co, Chicago, Ill
I C Yawger, N Y City

CARS (DUMP and MINE)
Edw P Allis Co, Milwaukee, Wis
M C Bullock Mfg Co, Chicago, Ill
Colorado Iron Works, Denver, Colo
Fairbanks, Morse & Co, Chicago, Ill
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, 8 Francisco, Cal
Parke & Lacy Co, 8 Francisco, Cal
Thomson & Boyle, Los Angeles, Cal
Weber Gas & Gasoline Eng Co, Kansas City, Mo
J Wigmore & Sons Co, Los Angeles, Cal

CASTINGS
Baker Iron Wks, Los Angeles, Cal
Chrome Steel Wks, Brooklyn, N Y
Joshua Hendy Machine Wks, 8 Francisco, Cal
Jas Leffel & Co, Springfield, O
Ruggles-Coles Engineering Co, N Y City

CHEMICALS
Baker & Adamson Chemical Co, Easton, Pa
F W Braun & Co, Los Angeles, Cal
Consolidated Kansas City Smelting & Refining Co, Argentine, Kan.
Denver Fire Clay Co, Denver, Colo
Richards & Co., Ltd, N Y City
Roessler & Hasslacher Chemical Co, N Y City
Schoellkopf, Hartford & Maclagan, N Y City
John Taylor & Co, 8 Francisco, Cal
Western Chemical Co, Denver, Colo

COAL CRUSHERS
Link-Belt Machinery Co, Chicago, Ill
Williams Patent Crusher & Pulverizer Co, St Louis, Mo.

COAL CUTTERS
Ingersoll-Sergeant Drill Co, N Y City
Jeffrey Mfg Co, Columbus, O
Link-Belt Machinery Co, Chicago, Ill
Parke & Lacy Co, 8 Francisco, Cal
Sullivan Machinery Co, Chicago, Ill

COAL-HANDLING MACHINERY
M C Bullock Mfg Co, Chicago, Ill
Henshaw, Bulkley & Co, 8 Francisco, Cal
Jeffrey Mfg Co, Columbus, O
Link-Belt Machinery Co, Chicago, Ill
Parke & Lacy Co, 8 Francisco, Cal
Robins Conveying Belt Co, N Y City
S S Machinery Co, Denver, Colo
Trenton Iron Co, Trenton, N J

CONCENTRATORS, CRUSHERS, ETC.
Edw P Allis Co, Milwaukee, Wis
Bradley Pulverizer Co, Boston, Mass
F W Braun & Co, Los Angeles, Cal
Frue Vanning Machine Co, 8 Francisco, Cal
Gates Iron Works, Chicago, Ill
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, 8 Francisco, Cal
Link-Belt Machinery Co, Chicago, Ill
New Standard Co, Los Angeles, Cal
Parke & Lacy Co, 8 Francisco, Cal
Willis Shaw, Chicago, Ill
S S Machinery Co, Denver, Colo
John Taylor & Co, 8 Francisco, Cal
J Wigmore & Sons Co, Los Angeles, Cal
Williams Patent Crusher & Pulverizer Co, St Louis, Mo
Woodbury Concentrator, 8 Francisco, Cal

CONVEYING MACHINERY
Colorado Iron Wks, Denver, Colo
W H Emanuel, Denver, Colo
Adolf Frese, Los Angeles, Cal
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, 8 Francisco, Cal
Jeffrey Mfg Co, Columbus, O
Ridgerwood Mfg Co, N Y City
Link-Belt Machinery Co, Chicago, Ill
Parke & Lacy Co, 8 Francisco, Cal
Robins Conveying Belt Co, N Y City
Trenton Iron Co, Trenton, N J

COPPER DEALERS
Montana Ore Purchasing Co, N Y City
State Ore Sampling Co, Denver, Colo

CUPEL MACHINES
F W Braun & Co, Los Angeles, Cal

CRUCIBLES
F W Braun & Co, Los Angeles, Cal
Denver Fire Clay Co, Denver, Colo
Jos Dixon Crucible Co, Jersey City, N J
John Taylor & Co, 8 Francisco Cal

CYANIDE
F W Braun & Co, Los Angeles, Cal
Roessler & Hasslacher Chemical Co, N Y City
Schoellkopf, Hartford & Maclagan, N Y City
John Taylor & Co, 8 Francisco, Cal

CYANIDE PLANTS
Thomson & Boyle, Los Angeles, Cal

DIAMONDS
American Diamond Rock Drill Co, N Y City
M C Bullock, Mfg Co, Chicago, Ill
Theo Lexow, N Y City
Sullivan Machinery Co, Chicago, Ill
I C Yawger, N Y City

DIAMOND DRILLS
American Diamond Rock Drill Co, N Y City
M C Bullock Mfg Co, Chicago, Ill
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co 8 Francisco, Cal
Parke & Lacy Co, 8 Francisco, Cal
Sullivan Machinery Co, Chicago, Ill

DIAMOND DRILL DIAMONDS
Theo Lexow, N Y City
I C Yawger, N Y City

DRAWING MATERIALS
F E Brandis, Sons & Co Brooklyn, N Y
Eugene Dietzgen Co, Chicago, Ill
Jos Dixon Crucible Co, Jersey City, N J
Adolf Frese, Los Angeles, Cal
F C Knight & Co, Philadelphia, Pa
L Manasse Co, Chicago, Ill
Queen & Co, Philadelphia, Pa
I Wiebe & Co, Philadelphia, Pa

DREDGING MACHINERY
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, 8 Francisco, Cal
Jeffrey Mfg Co, Columbus, O
Ridgerwood Mfg Co, N Y City
Parke & Lacy Co, 8 Francisco, Cal
Robins Conveying Belt Co, N Y City
Weber Gas & Gasoline Eng Co, Kansas City, Mo

DRILLS (ROCK)
Edw P Allis Co, Milwaukee, Wis
American Diamond Rock Drill Co, N Y City
M C Bullock Mfg Co, Chicago, Ill
W H Emanuel, Denver, Colo
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, San Francisco, Cal
Howells Mining Drill Co, Plymouth, Pa
Ingersoll-Sergeant Drill Co, N Y City
Parke & Lacy Co, 8 Francisco, Cal
Willis Shaw, Chicago, Ill
Sullivan Machinery Co, Chicago, Ill
J Wigmore & Sons Co, Los Angeles, Cal

DRILL STEEL
M C Bullock Mfg Co, Chicago, Ill
Joshua Hendy Machine Wks, 8 Francisco, Cal
Ingersoll-Sergeant Drill Co, N Y City
Parke & Lacy Co, 8 Francisco, Cal
J Wigmore & Sons Co, Los Angeles, Cal

DRYERS
Colorado Iron Wks, Denver, Colo
F D Cummer & Sons Co, Cleveland, O
Joshua Hendy Machine Wks, 8 Francisco, Cal
Parke & Lacy Co, 8 Francisco, Cal
Ruggles-Coles Engineering Co, N Y City

DRY WASHERS
A G Godfrey, Los Angeles, Cal

DUMP CARS
Edw P Allis Co, Milwaukee, Wis
M C Bullock Mfg Co, Chicago, Ill
Colorado Iron Wks, Denver, Colo
Fairbanks, Morse & Co, Chicago, Ill
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley & Co, 8 Francisco, Cal
Parke & Lacy Co, 8 Francisco, Cal
Willis Shaw, Chicago, Ill
Thomson & Boyle, Los Angeles, Cal
Trenton Iron Co, Trenton, N J
Weber Gas & Gasoline Eng Co, Kansas City, Mo
J Wigmore & Sons Co, Los Angeles, Cal

ELECTRICAL SUPPLIES
American Impulse Wheel Co, N Y City
Joshua Hendy Machine Wks, 8 Francisco, Cal
Jeffrey Mfg Co, Columbus, O
John Taylor & Co, 8 Francisco, Cal

ELECTRIC HOISTS
Ridgerwood Mfg Co, N Y City
Link-Belt Machinery Co, Chicago, Ill

ELEVATORS (CONVEYORS)
Colorado Iron Wks, Denver, Colo
Joshua Hendy Machine Wks, 8 Francisco, Cal
Henshaw, Bulkley &Co, 8 Francisco, Cal
Jeffrey Mfg. Co, Columbus, O
Link-Belt Machinery Co, Chicago, Ill
Parke & Lacy Co, 8 Francisco, Cal
Robins Conveying Belt Co, N Y City
S S Machinery Co, Denver, Colo
J Wigmore & Sons Co, Los Angeles, Cal

ENGINES
Edw P Allis Co, Milwaukee, Wis
M C Bullock Mfg Co, Chicago, Ill
Jeffrey Mfg Co Columbus, O
Jas Leffel & Co Springfield, O
Chas C Moore & Co, 8 Francisco, Cal
Murray Iron Works Co, Burlington, Ia
Oriental Gas Engine Co, 8 Francisco, Cal
Parke & Lacy, 8 Francisco, Cal
S S Machinery Co, Denver, Colo
Temple Machine Co, Los Angeles, Cal
Union Gas Engine Co, 8 Francisco, Cal
Weber Gas & Gasoline Eng Co, Kansas City, Mo
J Wigmore & Sons Co, Los Angeles, Cal

ENGINEERS' INSTRUMENTS
Theo Altenpder & Sons, Philadelphia, Pa
C L Berger & Sons, Boston, Mass
F E Brandis Sons & Co, Brooklyn, N Y
E Dietzgen Co, Chicago, Ill
Adolf Frese, Los Angeles, Ca
F C Knight & Co, Philadelphia, Pa
Colorado Iron Wks, Denver, Colo
Baker Iron Wks, Los Angeles, Cal

(Continued on page XI.)

BOOKS ON MINING AND METALLURGY.

A CAREFULLY SELECTED LIST OF STANDARD WORKS FOR PRACTICAL MINERS, METALLURGISTS, MINING ENGINEERS AND METAL MANUFACTURERS, CHEMISTS AND ASSAYERS

The Metallurgy of Gold. By M. Eissler. Fourth edition, revised and greatly enlarged. 187 illustrations. 12mo, cloth.....$5.00

A Practical Treatise on the Metallurgical Treatment of Gold-Bearing Ores, including the Processes of Concentration and Chlorination, and the Assaying, Melting and Refining of Gold. Full attention is given to the developments in the cyanide processes; and in the five chapters devoted to the subject those metallurgists who desire to avail themselves of the cyanide process will find the methods of procedure described with sufficient fullness and completeness for practical purposes. Not only the working details, but full particulars of the results actually obtained, are given, while a chapter is devoted to the chemistry of the process.

The Metallurgy of Silver. By M. Eissler. A Practical Treatise on the Amalgamation, Roasting and Lixiviation of Silver Ores, including the Assaying, Melting and Refining of Silver Bullion 124 illustrations Second edition, enlarged. 12mo, cloth, $4.00

Contents: The Washoe Process of Free Milling on the Comstock Lode, Machinery employed in Crushing and Amalgamating, Cost and Results of Milling Operations, Treatment of Slimes and Tailings, The Washoe Process as applied in other Mining Districts, Chemistry of the Washoe Process, The Dry Process; Chloridising, Roasting and Amalgamation, Roasting Furnaces and Kindred Appliances, Sundry Appliances for Silver Milling, Concentration and Ore Dressing, Extraction of Silver by Leaching Processes, Melting and Assaying

The Metallurgy of Argentiferous Lead. By M. Eissler. A Practical Treatise on the Smelting of Silver-Lead Ores and the Refining of Lead Bullion. Including Reports on Various Smelting Establishments and Descriptions of Modern Smelting Furnaces and Plants in Europe and America. With 183 illustrations: 8vo, cloth.....$5.00

Cyanide Process for the Extraction of Gold and its Practical Application on the Witwatersrand Gold Fields in South Africa. By M. Eissler. Second edition enlarged. 8vo, cloth. Illustrations and folding plates.....$3.00

Engineering Chemistry. By Joshua Phillips. A Practical Treatise for the use of Analytical Chemists, Engineers, Iron Masters, Iron Founders, Students and others. Comprising methods of Analysis and Valuation of the principal materials used in Engineering works, with numerous Analyses, Examples and Suggestions. 314 illustrations. Second edition, revised and enlarged. 8vo, cloth.....$4.00

A Practical Treatise on Hydraulic Mining in California. By Aug. J. Bowie, Jun., M. E. With Description of the Use and Construction of Ditches, Flumes, Wrought-iron Pipes and Dams; Flow of Water on Heavy Grades and its Applicability, under High Pressure to Mining. Fifth edition. Small quarto, cloth. Illustrated.....$5.00

The Prospector's Handbook. By J. W. Anderson. A Guide for the Prospector and Traveller in search of Metal-bearing or other Valuable Minerals. Seventh edition, thoroughly revised and much enlarged 8vo, cloth.....$1.50

A Manual of Practical Assaying. By H. Van F. Furman. Fourth edition with five Appendices on most recent methods, 8vo, cloth.....$3.00

Contents: Part I. Introductory. Part II. Determinations. Part III. Special Assays and Analysis. Part IV. Calculations.

Notes on Assaying. By P. De Peyster Ricketts, E. M. Ph. D and Edmund H. Miller, A. M, Ph. D., 8vo, cloth.....$3.00

Prepared with special reference to the wants of the student and practical assayer. Containing also Instructions for laboratory tests by Cyanide, Chlorination, Russell Process, etc., Assayers Outfit, Rapid Volumetric Methods for the Analysis of Ores, etc.

The Alloys and their Constituents. By Prof. Robt. H Thurston, Cornell University. Second edition, 8vo, cloth.....$2.50

Copper, Tin, Zinc, Lead, Antimony, Bismuth, Nickel, Aluminum, etc.; The Brasses, Bronzes, Copper-Tin-Zinc Alloys; Other Valuable Alloys; Their Qualities, Peculiar Characteristics; Uses and Special Adaptions, Thurston's "Maximum Alloys"; Strength of the Alloys as Commonly made and as affected by Special conditions; The Mechanical Treatment of Metals.

Notes on the Treatment of Gold Ore. By Florence O'Driscoll, 8vo, cloth.....$2.00

"It is an interesting discussion of the properties of gold, its occurrences, the methods of procedure in mining in late years, with the losses incident thereto and remedies for the same. The main object in presenting the work has been to make clear a few misconceptions on the subject, the most fatal of these being that any one method of treatment is efficacious in dealing with all classes of gold ores."—*American Manufacturer.*

Metallurgy of Silver, Gold and Mercury in the United States By Prof. Thos Egleston, School of Mines, Columbia University With corrections Vol. I.—Silver, 8vo.....$7.50

Showing the latest practice pursued in American Metallurgical Establishments. With 180 engravings and folding plates, tables, etc

Vol. II.—Gold, Mercury, etc. Illustrated with 140 engravings and folding plates, 935 pages, 8vo, cloth.....$7.50

"These treatises cover the whole range of the metallurgy of silver, gold and mercury in this country, and in a clear, pleasing and interesting manner convey information of exceeding value to all in any manner interested in the production of these precious metals."—*Engineering News*

Iron and Steel. By Prof. Robt. H. Thurston, Cornell University. Sixth edition, revised. 8vo, cloth. $3.50

The Ores of Iron; Methods of Reduction; Manufacturing Processes, Chemical and Physical Properties of Iron and Steel; Strength, Ductility, Elasticity and Resistance; Effects of Time, Temperature and Repeated Strain; Methods of Test; Specifications.

"Should be in the hands not only of all Engineers but of all Mine Owners and Metallurgists as well."—*Mining Review.*

Hydraulic and Placer Mining. By E. B. Wilson, M. E. 12mo, cloth.....$2.00

Contents: Uses of Water in Mining, Geology of Placer Deposits, Gold Recovery by various methods, Panning, Cradles, Long Tom, Booming, Sluicing, Riffles, Flumes, Ditches, Dams, Pipes, Giants, Valves, Gates, Wiers, Miner's Inch, Pressure Box, Dimet Gravel Elevators, Exploiting, Dredging Rivers, Traction Dredgers, Appendix containing Location of Claims and General Information.

The Modern High Explosives—Nitro-Glycerine and Dynamite. By Manuel Eissler, Mining Engineer. With many illustrative plates. Third edition 8vo, cloth.....$4.00

Their Manufacture, their Use and their Application to Mining and Military Engineering; Pyroxyline or Gun Cotton, the Fulminates, Picrates and Chlorates; also, the Chemistry and Analysis of the Elementary Bodies which enter into the Manufacture of the principal Nitro Compounds.

The Ventilation of Mines. By J. T. Beard, C. E., E. M., Secretary of the State Board of Examiners for Mine Inspectors, Iowa. 12mo, cloth.....$2.50

Designed for use in Schools and Colleges and for practical mining men in their study of the subject.

Manual of Mining. By Prof. Magnus C. Ihlseng, E.M., Ph. D. Third edition, revised and enlarged. 8vo, cloth.....$4.00

For the use of Mining Engineers and Technical Schools. Treating of Preparatory and Exploratory Work. Methods of Mining, Hoisting Machinery, Pumping, Ventilation Shafts, Tunnels, Blasting, Timbering, etc.

The text has been increased by more than fifty pages in order to introduce additional matter pertaining to the design of cars hoisting appliances and fans

Catalogue of American Localities of Minerals. By E. S. Dana. Reprinted from sixth edition of the System. 8vo, cloth.....$1.00

A Description of Minerals of Commercial Value. By D. M. Barringer, A. M., LL. B. 168 pages. Oblong, morocco binding.....$2.50

A Practical Reference Book for the Miner, Prospector and Business Man, or any Person who may be interested in the Extraction or Treatment of the Various Metallic or Non-metallic Minerals and for Students either in Field-work or Laboratory.

The Metallurgy of Iron. By Thomas Turner, Associate of the Royal School of Mines. Illustrated by 80 engravings, octavo, 381 pages. cloth.....$5.00

This book is primarily intended for persons who are connected with the manufacture of iron and steel, and who may be assumed to have already some general knowledge of the subject discussed. At the same time the volume may not be without interest to others than those for whom it was specially prepared.

"A most valuable summary of useful knowledge relating to every method and stage in the manufacture of cast and wrought iron. An exhaustive and really needed compilation."—*Bulletin of the American Iron and Steel Association*

The Chlorination Process. By E. B. Wilson, E. M., 12mo, cloth.....$1.50

Contents: Lixiviation by Chlorine Solutions; Preparation of the Ore-Roasting Furnaces; The Leaching Process; Filtering; Precipitation; Refining the Precipitates; Resume of Chlorination and Plant; Cost of Chlorination

A Treatise on Mine-Surveying. By B. H. Brough, Associate of Royal School of Mines. With 102 illustrations. Octavo, 340 pages, cloth..... $2.50

The work is intended primarily for students; and, at the same time, it will also be found useful as a companion to the standard works of reference on land surveying. The methods of surveying in the Pennsylvania anthracite mines are fully dwelt on, and, the most recent forms of American instruments are described and illustrated. A description is also given of the methods adopted in the survey of metalliferous mine claims in the Western United States.

"It is the kind of book which has long been wanted and no English-speaking mine agent or mining student will consider his technical library complete without it."—*Nature.*

Prospecting for Minerals. A Practical Handbook for Prospectors, Explorers, Settlers and all interested in the Opening-up and Development of New Land. By S. Herbert Cox. With illustrations. Large crown octavo.....$2.00

The object of this volume is to give a sketch of those subjects which underlie the calling of the prospector without encroaching to any great extent upon the provinces occupied by the sciences of mineralogy and geology or the arts of mining and metallurgy. To the practical prospector it may give certain hints as regards the recognition of minerals with which he is unacquainted, while to the student it may afford an introduction to the subject which will be of use in directing his work into the proper channels

Getting Gold. A Gold-Mining Hand-Book for Practical Men. By J. C. F. Johnson, F. G. S., A. I. M. E. With illustrations. Crown octavo, cloth..... $1.50

A compendium, in specially concrete form, of useful information respecting the processes of winning from the soil and after treatment of gold and gold ores, including some original discoveries by the author. Practical information, original and selected, is given to mining company directors, mine managers, quartzmill operators and prospectors.

A Text-Book of Assaying. By C. and J. J. Beringer For the use of those connected with mines. Third edition. With numerous Diagrams and Index. Crown octavo. 400 pages. Cloth..... $3.25

Prepared to meet the existing want of a practical "handy-book" for the assayer. The author has given the results of a series of experiments showing the effect of varying conditions on the accuracy of the process. Statements like those generally made, that "this or that substance interferes," are insufficient. It is necessary to know under what conditions and extent.

"A really meritorious work, that may be safely depended upon either for systematic instruction or for reference."—*Nature*

Blasting. By Oscar Guttmann, Assoc. M. Inst. C. E. A Hand-Book for the use of Engineers, and others engaged in Mining, Tunnelling, Quarrying, etc With 136 illustrations. Octavo, cloth.....$3.50

Mr. Guttmann's "Blasting" is the only work on the subject which gives full information as to the new methods adopted since the introduction of dynamite, and at the same time, the results of many years practical experience both in mining work and in the manufacture of explosives. It therefore presents in concise form all that has been *proved* good in the various methods of procedure.

Electric Smelting and Refining. A Practical Manual of the Extraction and Treatment of Metals by Electrical Methods. The "Elektro-Metallurgie" of Dr. W. Borchers, translated by Walter G. McMillan, F. I. C., F. C. S. With numerous illustrations and folding plates. Large octavo.....$6.50

Dr. Borcher's treatise is practical throughout. It confines itself to one branch of electro-chemistry—viz., electrolysis, a subject which is daily becoming of more and more importance to the practical metallurgist and manufacturer. In the extraction of Aluminum, the refining of copper, the treatment of gold and other metals, electrical processes are fast taking the place of the older methods.

"Dr. Borcher's well-known work . . . must of necessity be required by every one interested in the subject. It is excellently put in English, with additional matter by Mr. McMillan."—*Nature.*

The Story of American Coals. By William Jasper Nicolls, M. Am. Soc. C. E. Buckram, gilt top, deckle edges, with complete index.....$3.50

"It is as much historical as scientific, and scientific without being at all technical. The author, Mr. Nicolls, has adopted a pleasing simple style of writing which causes the reader to be loath to lay the book down until it is finished."—*Phila. Ledger.*

Sent Post Paid to any address on receipt of Price.

We will endeavor to secure, for subscribers and customers, any other book on Mining, Metallurgy, and kindred subjects.

Address, **Book Department, THE MINING AND METALLURGICAL JOURNAL, 32 Broadway, New York City.**

EXCAVATORS
Henshaw, Bulkley & Co, San Francisco, Cal
Parke & Lacy, San Francisco, Cal
Trenton Iron Co, Trenton, N J

EXPLOSIVES
Metallic Cap Mfg Co, N Y City
Parke & Lacy Co, San Francisco, Cal
J Wigmore & Sons Co, Los Angeles, Cal

FEED WATER HEATERS
Berg E Kelley & Son, N Y City
Frank B Patterson, N Y City

FILTER PAPERS
Baker & Adamson Chemical Co, Easton, Pa
J W Braun & Co, Los Angeles, Cal
Roessler & Hasslacher Chemical Co, N Y City
Schoellkopf, Hartford & Maclaughan, N Y City
Western Chemical Co, Denver, Colo

FIRE BRICKS AND CLAY
F W Braun & Co, Los Angeles, Cal
Denver Fire Clay Co, Denver, Colo
John Taylor & Co, San Francisco, Cal

FORGINGS.
Baker Iron Wks, Los Angeles, Cal
Fulton Engine Wks, Los Angeles, Cal
Joshua Hendy Machine Wks, San Francisco, Cal
Hercules Gas Engine Wks, San Francisco, Cal

FURNACES
F W Braun & Co, Los Angeles, Cal
Colorado Iron Wks, Denver, Colo
Joshua Hendy Machine Wks, San Francisco, Cal
Wm Hoskins, Chicago, Ill
Parke & Lacy Co, San Francisco, Cal
John Taylor & Co, San Francisco, Cal

GAS ENGINES
Fairbanks, Morse & Co, Chicago, Ill
Joshua Hendy Machine Wks, San Francisco, Cal
Henshaw, Bulkley & Co, San Francisco, Cal
Hercules Gas Engine Co, San Francisco, Cal
Oriental Gas Engine Co, San Francisco, Cal
Parke & Lacy Co, San Francisco, Cal
S S Machinery Co, Denver, Colo
Temple Machine Co, Denver, Colo
Union Gas Engine Co, San Francisco, Cal
Weber Gas & Gasoline Eng Co, Kansas City, Mo
J Wigmore & Sons Co, Los Angeles, Cal

GASOLINE ENGINES AND HOISTS
Union Gas Engine Co, San Francisco, Cal
Weber Gas & Gasoline Eng Co, Kansas City, Mo

GEARING
Edw P Allis Co, Milwaukee, Wis
Joshua Hendy Machine Wks, San Francisco, Cal
Hercules Gas Engine Wks, San Francisco, Cal
Jas Leffel & Co, Springfield, O
Link-Belt Machinery Co, Chicago, Ill
J Wigmore & Sons Co, Los Angeles, Cal
Henshaw, Bulkley & Co, San Francisco, Cal
Hercules Gas Engine Wks, San Francisco, Cal

GOLD WASHERS
A G Godfrey, Los Angeles, Cal
Russell & Kinsey, Los Angeles, Cal

GREASE, GRAPHITE, ETC.
Adam Cook's Sons, N Y City
Jos Dixon Crucible Co, Jersey City, N J
Joshua Hendy Machine Wks, San Francisco, Cal
Hendrie & Bolthoff Co, San Francisco, Cal
Parke & Lacy Co, San Francisco, Cal
Peter Palmer & Sons, N Y City

GREASE AND OIL CUPS
American Injector Co, Detroit, Mich
Peter Palmer & Sons, N Y City

GRIZZLY PLATES
Ingold Antifriction Perforated Metal Co, Chicago, Ill

HOISTING MACHINERY
Edw P Allis Co, Milwaukee, Wis
M C Bullock Mfg Co, Chicago, Ill
Colorado Iron Wks, Denver, Colo
W H Emmanuel, Denver, Colo
Fairbanks, Morse & Co, Chicago, Ill
Joshua Hendy Machine Wks, San Francisco, Cal
Hendrie & Bolthoff Mfg & Supply Co, Denver, Colo
Jeffrey Mfg Co, Columbus, O
Leschen Wire Rope Co, New York City
Link Belt Machinery Co, Chicago, Ill
Morris Iron Works Co, Burlington, Ia
Oriental Gas Engine Co, San Francisco, Cal
Parke & Lacy Co, San Francisco, Cal
S S Machinery Co, Denver, Colo
Trenton Iron Co, Trenton, N J
Union Gas Engine Co, San Francisco, Cal
Weber Gas & Gasoline Eng Co, Kansas City, Mo
J Wigmore & Sons Co, Los Angeles, Cal

HYDRAULIC MACHINERY
American Impulse Wheel Co, New York City
W H Emmanuel, Denver, Colo
Joshua Hendy Machine Wks, San Francisco, Cal
Henshaw, Bulkley & Co, San Francisco, Cal
Jas Leffel & Co, Springfield, O
Parke & Lacy, San Francisco, Cal
Weber Gas & Gasoline Eng Co, Kansas City, Mo

HYDRAULIC PACKINGS
Goodall Packing Co, Chicago, Ill

INJECTORS
American Injector Co, Detroit, Mich

INSULATED WIRES
Joshua Hendy Machine Wks, San Francisco, Cal
John Taylor & Co, San Francisco, Cal

LAMPS
Imperial Gas Lamp Co, Chicago, Ill

LAWYERS
Chas S McKelvey, Los Angeles, Cal
Harlow & Collins, Nogales, Ariz

LINK BELTING
Joshua Hendy Machine Wks, San Francisco, Cal
Henshaw, Bulkley & Co, San Francisco, Cal
Link Belt Machinery Co, Chicago, Ill
Parke & Lacy, San Francisco, Cal
Taylor Iron and Steel Co, High Bridge, N J
J Wigmore & Sons Co, Los Angeles, Cal

MACHINERY (GENERAL)
Aberdroth & Root, New York City
American Diamond Rock Drill Co, New York City
American Impulse Wheel Co, New York City
Baker Iron Wks, Los Angeles, Cal
M C Bullock Mfg Co, Chicago, Ill
Colorado Iron Wks, Denver, Colo
W H Emmanuel, Denver, Colo
Fairbanks, Morse & Co, Chicago, Ill
Fulton Engine Wks, Los Angeles, Cal
Gates Iron Works, Chicago, Ill
Joshua Hendy Machine Wks, San Francisco, Cal
Henshaw, Bulkley & Co, San Francisco, Cal
Ingersoll Drill & Mfg Co, Denver, Colo
Jeffrey Mfg Co, Columbus, O
Berg E Kelley & Son, New York City
Link-Belt Machinery Co, Chicago, Ill
Chas C Moore & Co, San Francisco, Cal
Murray Iron Works Co, Burlington, Ia
Parke & Lacy Co, San Francisco, Cal
Ruggles-Coles Engineering Co, New York City
W H Shaw, Chicago, Ill
S S Machinery Co, Denver, Colo
Scott Supply & Fuel Co, Denver, Colo
Sullivan Machinery Co, Chicago, Ill
Temple Machine Co, Denver, Colo
Weber Gas & Gasoline Eng Co, Kansas City, Mo
Walsh & Sons & Co, Newark, N J
J Wigmore & Sons Co, Los Angeles, Cal

MANGANESE STEEL
Taylor Iron & Steel Co, High Bridge, N J

METAL DEALERS
Baker & Co, New York City and Newark, N J
Consolidated Kansas City Smelting & Refining Co, Argentine, Kan
Edwards, Matthews & Co, London, Eng
D W Eckhart, El Paso, Tex
State Ore Sample Wks, Denver, Colo

METALLURGICAL WORKS
Lew F Aubury, Los Angeles, Cal
Consolidated Kansas City Smelting & Refining Co, Argentine, Kan
Gold & Silver Extraction Co, Denver, Colo
Jas Irving & Co, Los Angeles, Cal
G O McNamara, Florence, Ariz
Montana Ore Purchasing Co, New York City
R A Perez, Los Angeles, Cal
Ricketts & Banks, New York City
Selby Smelting & Lead Co, San Francisco, Cal
State Ore Sample Wks, Denver, Colo
Wade & Wade, Los Angeles, Cal

MINE CARS
M C Bullock Mfg Co, Chicago, Ill
Colorado Iron Wks, Denver, Colo
Fairbanks, Morse & Co, Chicago, Ill
Joshua Hendy Machine Wks, San Francisco, Cal
Henshaw, Bulkley & Co, San Francisco, Cal
Jeffrey Mfg Co, Columbus, O
Link Belt Machinery Co, Chicago, Ill
Parke & Lacy Co, San Francisco, Cal
C J Tallon, San Francisco, Cal
Thomas A Boyle, Los Angeles, Cal
Weber Gas & Gasoline Eng Co, Kansas City, Mo
J Wigmore & Sons Co, Los Angeles, Cal

MINING ENGINEERS
Lew F Aubury, Los Angeles, Cal
John A Church, New York City
Wm M Courtis, Detroit, Mich
Chas L Dignowity, Boston, Mass
Harlow & Collins, Nogales, Ariz
C W Kempton, New York City
Walter Hovey Hill, Grangeville, Ida
M H Lyon, Joplin, Mo
J W McCoy, Chicago, Ill
P B M Cox, New York City
G O McNamara, Boise, Ida
R A Perez, Los Angeles, Cal
J E Sexton, Pinecreek, Cal
Symonds & Walmwright, New York City
Theo F Van Wagenen, Denver, Colo
Morgan-Watson Mining & Construction Co, Cleveland, O
D W Rockhart, El Paso, Tex
Weis & Gibson, Chicago, Ill

MINERAL SPECIMENS
Roy Hopping, New York City

MINING COMPANIES
Lac Elvas Colmolo, Tepic, Mex
Little & Co, Galena, Kans
Montana Ore Purchasing Co, New York City
Morgan-Watson Mining & Construction Co, Cleveland, O

MINING SCHOOLS
A Van Der Naillen, San Francisco, Cal

OIL WELL MACHINERY
Keystone Driller Co, Beaver Falls, Pa

OIL WELL CASING COMPANIES
Baker & Co, New York City, and Newark, N J
Consolidated Kansas City Smelting & Refining Co, Argentine, Kan
Gold & Silver Extraction Co, Denver, Colo
Jas Irvine & Co, Los Angeles, Cal
Montana Ore Purchasing Co, New York City
Ogden Assay Co, Denver, Colo
Selby Smelting & Lead Co, San Francisco, Cal
State Ore Sampling Wks, Denver, Colo

ORE TESTING COMPANIES
L E Anbury, Los Angeles, Cal
Consolidated Kansas City Smelting & Refining Co, Argentine, Kan
Gould & Selover Extraction Co, Denver, Colo
Jas Irving & Co, Los Angeles, Cal
Montana Ore Purchasing Co, New York City
R A Perez, Los Angeles, Cal
Ricketts & Banks, New York City
State Ore Sampling Wks, Denver, Colo
Wade & Wade, Los Angeles, Cal

PACKING
Adam Cook's Sons, New York City
Duval Metallic Packing Co, New York City
H C Tower, San Francisco, Cal
Goodall Packing Co, Chicago, Ill
Goodyear Rubber Co, San Francisco, Cal
Joshua Hendy Machine Wks, San Francisco, Cal
Parke & Lacy Co, San Francisco, Cal
Quaker City Rubber Co, Philadelphia, Pa

PATENTS
C H M y Agramonte, Mexico City, Mex
Townsend Bros, Los Angeles, Cal

PERFORATED METALS
Ball Anthon Perforated Metal Co, Chicago, Ill
Edw P Allis Co, Milwaukee, Wis
American Metal Screen Co, New York City
Cal Perforating Screen Co, San Francisco, Cal
Estey Wire Works, New York City
Joshua Hendy Machine Wks, San Francisco, Cal
Parke & Lacy Co, San Francisco, Cal
San Francisco Perforated Screen Wks, San Francisco, Cal

PICKING TABLES
Link-Belt Machinery Co, Chicago, Ill

PILE DRIVERS
Henshaw, Bulkley & Co, San Francisco, Cal
Ingersoll-Sergeant Drill Co, New York City
Lidgerwood Mfg Co, New York City
Weber Gas & Gasoline Eng Co, Kansas City, Mo

PIPES
Aberdroth & Root, New York City
Asphalt Paper Pipe Co, Los Angeles, Cal
Joshua Hendy Machine Wks, San Francisco, Cal
Parke & Lacy Co, San Francisco, Cal
Wm Bagaley & Sons, Pittsburg, Pa
Francis Smith & Co, San Francisco, Cal
S S Machinery Co, Denver, Colo
Thomason & Boyle, Los Angeles, Cal
Wenger Pipe Wks, Denver, Colo

PLATE IRON AND STEEL
Wm B Scaife & Sons, Pittsburg, Pa
Francis Smith & Co, San Francisco, Cal

PLATINUM
Baker & Co, New York City and Newark, N J
Johnson, Matthey & Co, London, Eng

PULVERIZERS
Bradley Pulverizer Co, Boston, Mass
Colorado Iron Wks, Denver, Colo
Gates Iron Works, Chicago, Ill

Continued from page XIII

BUYERS' GUIDE (Continued)

Jeffrey Mfg. Co,	Columbus, O
Parke & Lacy Co,	S Francisco, Cal
Williams Patent Crusher & Pulverizer Co,	St Louis, Mo
PUMPS	
American Injector Co,	Detroit, Mich
Baker Iron Wks,	Los Angeles, Cal
Geo Dow Pumping Engine Co.	San Francisco,
W H Emanuel,	Denver, Colo
Fairbanks, Morse & Co,	Chicago, Ill
Joshua Hendy Machine Wks,	S Francisco, Cal
Henshaw, Bulkley & Co,	S Francisco, Cal
Hercules Gas Engine Wks,	S Francisco, Cal
Benj F Kelley & Son,	N Y City
Link-Belt Machinery Co,	Chicago, Ill
Chas C Moore & Co,	S Francisco, Cal
Oriental Gas Engine Co,	S Francisco, Cal
Parke & Lacy Co,	S Francisco, Cal
Pulsometer Steam Pump Co,	N Y City
S S Machinery Co,	Denver, Colo
Weber Gas & Gasoline Eng Co,	Kansas City, Mo
J Wigmore & Sons Co,	Los Angeles, Cal
POWDER	
California Vigorit Powder Co,	S Francisco, Cal
J Wigmore & Sons Co,	Los Angeles, Cal
PUMPS (HAND)	
Abendroth & Root,	N Y City
QUARRYING MACHINES	
W H Emanuel	Denver, Colo
Henshaw, Bulkley & Co,	S Francisco, Cal
Parke & Lacy Co,	S Francisco, Cal
Sullivan Machinery Co,	Chicago, Ill
RAILROADS	
Sante Fe Route,	S Francisco, Cal
RAILS	
C. J. Tallon,	S Francisco, Cal
ROOFING	
Paraffine Paint Co,	Los Angeles, Cal
Wm B Scaife & Sons,	Pittsburg, Pa
Warren Chemical & Mfg Co,	N Y City
SCALES AND BALANCES	
Wm Ainsworth & Sons,	Denver, Colo
F W Braun & Co,	Los Angeles, Cal
Denver Fire Clay Co,	Denver, Colo
Adolf Frese,	Los Angeles, Cal
L Manasse Co,	Chicago, Ill
Queen & Co,	Philadelphia, Pa
Richards & Co., Ltd,	N Y City
Smith & Thompson,	Denver, Colo
Henry Troemner,	Philadelphia, Pa
SCREENS	
Robt Aitchison Perforated Metal Co,	Chicago, Ill
Edw P Allis Co,	Milwaukee, Wis
California Perforated Screen Co,	S Francisco, Cal
Colorado Iron Wks,	Denver, Colo
Estey Wire Works,	N Y City
Gates Iron Works,	Chicago, Ill
Joshua Hendy Machine Wks,	S Francisco, Cal
Jeffrey Mfg. Co,	Columbus, O
Link-Belt Machinery Co,	Chicago, Ill
Parke & Lacy Co,	S Francisco, Cal
San Francisco Pioneer Screen Wks,	S Francisco, Cal
John Taylor & Co,	S Francisco, Cal
Taylor Iron & Steel Co,	High Bridge, N J
SEPARATORS	
Chas C Moore & Co,	S Francisco, Cal
SHOES AND DIES	
Edw P Allis Co,	Milwaukee, Wis
Chrome Steel Works,	Brooklyn, N Y
Colorado Iron Wks,	Denver, Colo
Gates Iron Works,	Chicago, Ill
Parke & Lacy Co,	S Francisco, Cal
Taylor Iron & Steel Co,	High Bridge, N J
J Wigmore & Sons Co,	Los Angeles, Cal
SHOVELS (STEAM)	
Willis Shaw,	Chicago, Ill
SMELTING WORKS	
Consolidated Kansas City Smelting & Refining Co,	Argentine, Kan
Gold & Silver Extraction Co,	Denver, Colo
Joshua Hendy Machine Wks,	S Francisco, Cal
Henshaw, Bulkley & Co,	S Francisco, Cal
Johnson, Matthey & Co,	London, Eng
Montana Ore Purchasing Co,	N Y City
Selby Smelting & Lead Co,	S Francisco, Cal
State Ore Sampling Wks,	Denver, Colo
STEAM PIPE COVERING	
California Anti-Caloric Co,	S Francisco, Cal
G C Fowler,	S Francisco, Cal
STRAINERS	
Abendroth & Root,	N Y City
STRUCTURAL IRON AND STEEL	
Wm B Scaife & Sons,	Pittsburg, Pa
Joshua Hendy Machine Wks,	S Francisco Cal
TANKS	
Edw P Allis Co,	Milwaukee, Wis
Colorado Iron Wks,	Denver, Colo
Cypress Tank Co,	Bridgeport, Fla
Gates Iron Works,	Chicago, Ill
Joshua Hendy Machine Wks,	S Francisco, Cal
Henshaw, Bulkley & Co,	S Francisco, Cal
Pacific Tank Co,	S Francisco, Cal
Parke & Lacy Co,	S Francisco, Cal
Ruggles-Coles Engineering Co,	N Y City
Wm B Scaife & Sons,	Pittsburg, Pa
S S Machinery Co,	Denver, Colo
John Taylor & Co,	S Francisco, Cal
Thomson & Boyle,	Los Angeles, Cal
J Wigmore & Sons Co,	Los Angeles, Cal
TOOLS AND SUPPLIES	
Scott Supply & Tool Co,	Denver, Colo
Wm B Volger,	N Y City
TRANSITS (ENGINEERS')	
Wm Ainsworth & Sons,	Denver, Colo
C L Berger & Sons,	Boston, Mass
Adolf Frese,	Los Angeles, Cal
F C Knight & Co,	Philadelphia, Pa
L Manasse Co,	Chicago, Ill
TUBE CLEANERS	
Coggeshall Mfg Co,	N Y City
VALVES	
Abendroth & Root,	N Y City
Joshua Hendy Machine Wks,	S Francisco, Cal
VENTILATING FANS	
Parke & Lacy Co,	S Francisco, Cal
VOLTMETERS	
Abendroth & Root,	N Y City
WATER FILTERS	
Chas C Moore & Co,	S Francisco, Cal
Wm B Scaife & Sons,	Pittsburg, Pa
WELL-DRILLING MACHINERY	
American Diamond Rock Drill Co,	N Y City
M C Bullock Mfg Co,	Chicago, Ill
Joshua Hendy Machine Wks,	S Francisco, Cal
Henshaw, Bulkley & Co,	S Francisco, Cal
Parke & Lacy Co,	S Francisco, Cal
Sullivan Machinery Co,	Chicago, Ill
Weber Gas & Gasoline Eng Co,	Kansas City, Mo
Keystone Driller Co,	Beaver Falls, Pa
WHEELS (CAR)	
Fairbanks, Morse & Co,	Chicago, Ill
Gates Iron Works,	Chicago, Ill
Joshua Hendy Machine Wks,	S Francisco, Cal
Parke & Lacy Co,	S Francisco, Cal
Taylor Iron & Steel Co,	High Bridge, N J
J Wigmore & Sons Co,	Los Angeles, Cal
WHEELS (WATER)	
American Impulse Wheel Co,	N Y City
Jas Leffel & Co,	Springfield, O
J Wigmore & Sons Co,	Los Angeles, Cal
WIRE	
Joshua Hendy Machine Wks,	S Francisco, Cal
Parke & Lacy Co,	S Francisco, Cal
Trenton Iron Co,	Trenton, N J
J Wigmore & Sons Co,	Los Angeles, Cal
WIRE ROPE	
Trenton Iron Co,	Trenton, N J
WIRE ROPE TRAMWAYS	
Colorado Iron Wks,	Denver, Colo
W H Emanuel,	Denver, Colo
Joshua Hendy Machine Wks,	S Francisco, Cal
Henshaw, Bulkley & Co,	S Francisco, Cal
Parke & Lacy Co,	S Francisco, Cal
S S Machinery Co,	Denver, Colo
Trenton Iron Co,	Trenton, N J
J Wigmore & Sons Co,	Los Angeles, Cal
WOOD PRESERVATIVE	
Summerville Fernoline Wks,	Summerville, S C